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## CHANGES IN JUPITER'S BELTS.

By LATIMER J. WILSON.

Important changes seem to have occurred in the southern hemisphere of Jupiter since August, 1925. Reference to previous records of this planet as observed with the writer's 11-inch reflecting telescope can be found in POPULAR ASTRONOMY, Numbers 195, 199, 202, 208, 227, 241, and in Number 318. In the latter is a chart showing the mean drift in longitude of the Red Spot and the South Tropical Disturbance, both situated in the South Tropical Zone of Jupiter.

The difference in rate of motion displayed by the Red Spot and the South Tropical Disturbance caused the latter to overtake the former at intervals of approximately four and one-half years, a conjunction occurring at the end of 1912, another in 1917, and one in 1922. This conjunction had not ended at the close of 1924, both Red Spot (then identified by the notch cut in the southern component of the south equatorial belt) and preceding part of the southern disturbance then moving at the same rate. But since 1925 the latter seems to have been obliterated while the Red Spot itself has become faintly discernible.

The southern component of the south equatorial belt is dimly seen only in longitude 142°.3 in the region near that in which the South Tropical Disturbance should appear, were it in evidence. Here, according to an observation on July 28, 1926, at $23^h\ 55^m$ C.S.T., the south tropical zone is a mosaic of patches of brighter tint. There is no trace of the historic southern disturbance as seen during the past score of years.

The ellipsoidal form of the Red Spot was clearly displayed on July 21, 1926, at $0^h\ 40^m$ C.S.T., in longitude 46°.5 (center). This, applied to the chart published in POPULAR ASTRONOMY in October, 1924, falls into the mean motion of the Red Spot, whose motion should now be more regular since the influence of the South Tropical Disturbance is removed.

As a whole, the northern equatorial belt has become wider and darker, and the other belts of the northern hemisphere also seem stronger in tint. The south tropical zone has become brighter throughout, and seems slightly wider than normal, crowding into the equatorial belt and blotting it out on its southern border. The equatorial zone is

also darker than usual and may finally become a dark zone instead of a bright one. The obliteration of the southern component of the south equatorial belt, of course, makes the south tropical one a more conspicuous feature, but if there is any shift in latitude it is slight.

1405 Gartland Ave., Nashville, Tenn.

## REPORT ON MARS, NO. 37.

By WILLIAM H. PICKERING.

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### What I Believe About Mars.

Since this is obviously a personal statement including a general discussion, and not a record of new facts, it is recommended that those who are interested only in the latter should skip it. Schiaparelli set a precedent by making such a statement, and apparently as an excuse for so doing, prefaced it by the quotation "It is permitted to talk foolishly twice a year" (Flammarion's Mars II, 262). It required considerable courage on his part, since he was at that time being bitterly criticized by his fellow astronomers for insisting on the existence of the canals. It is sometimes said concerning him that the term "canale" which he used meant a channel, and that he did not really mean a canal as we use the term in English. In point of fact that is exactly what he did mean. He thought when he first used the term that the seas were water, and he remarks (translation) "These lines (the canals) owe their color to the same cause as that of the seas, and can only be canals or straits of communication" (Flammarion I, 298). Moreover, neither was he the originator of the term canal as applied to Mars, but undoubtedly took it from Father Secchi, who preceded him by twenty years. The latter in referring to what we now call the Syrtis or Syrtis major spoke of it as the "Atlantic Canal." Incidentally Secchi was, I believe, the first observer to record its occasional blue tint. Oddly enough he refers to the Ganges, which seems to have been an unusually conspicuous canal in his day, as the Isthmus (Flammarion I, 135).

Lowell made a still more definite "confession of faith," in his book "Mars," even before he was recognized as a Martian observer, and was roundly criticized for it by several astronomers. His confession was based fundamentally on a suggestion of mine, my first explanation of the canals. As a result of the Arequipa observations in 1892 it became evident, since the canals crossed the seas, that both could not be water. I suggested to him that as distinguished from the lighter regions the seas were fertile plains, and the canals strips of vegetation, irrigated as in Arequipa by small canals, which in the case of Mars were invisible to us. Later I abandoned the explanation, but as he wished it pub-

lished I gave my consent and it appears in his book "Mars," p. 165, in a form entirely satisfactory to me. Several years later Schiaparelli suggested the same idea (Flammarion II, 260). My objection to the theory was, since I tried to explain the whole canal system this way, that I believed that the water would not flow through the canals unless forced by artificial pumping, and I did not believe that any Martian inhabitants would undertake to produce a whole planetary circulation artificially. Lowell believed in pumping, but it was evident in any case that much of the water did not go that way, but was deposited as snow at the poles. Nevertheless he obtained many converts to his pumping hypothesis, and one of these, a hydraulic engineer, computed that the whole planetary circulation could be maintained by a constant expenditure of energy not exceeding 4000 times the power of Niagara.

My second explanation of the canals was that they were volcanic cracks, and that the steam expelled from them nourished the vegetation along their borders. When I visited Hawaii in 1905 I inquired for a desert containing steam cracks, and there photographed and later published a picture of a narrow band of vegetation crossing the desert, and maintained by the escaping steam. Nevertheless this idea did not satisfy me, since the Martian canals were so wide and so numerous that they would have involved an improbable amount of volcanic activity on that planet. This idea therefore was also abandoned.

My third explanation was due to a visit to the Azores in 1907. On one of the islands I noticed a distant hill striped and crossed with narrow dark lines. On inquiry it seemed that formerly the hill was densely wooded, but that most of the trees had been cut down to furnish pasturage for cattle. However, certain lines of them had been left standing in order to provide protection from the winter winds, which were cold and very severe. A photograph of this hill was also published (Harper's Monthly 1908, 192; see also my book "Mars" 1921, 147). That the Martian canals were planted lines of vegetation, or vegetation left standing in cleared fields, certainly seemed more practical than either of the two previous explanations, but shared with the first the objection that it involved the assumption, not necessarily impossible, of intelligent life upon the planet.

My fourth explanation of the canals has been already dealt with in some detail in Report No. **19**, and was also referred to in my last. It is based on my belief that on account of the lack of oceans, the Martian meteorology is much simpler than our own. There appear to be no cyclones on Mars, excepting perhaps during the semi-annual cloudy seasons, when broad dark bands having a large northerly or southerly inclination cross their deserts. These appear to be due to moistened soil. Occasionally perfectly round dark areas several hundred miles in extent suddenly appear and slowly fade out. No better explanation occurs to me than that these too are due to moistened ground. Possibly showers occur at night. Their meteorology appears to resemble somewhat that of our tropics, but is quite unlike that of our temperate

zones. My belief is that on account of this lack of oceans, Ferrel's theory of the winds applies much better to Mars than it does to the earth. The winds are believed to start in the polar swamps, where the moisture, evaporated during the late spring and early summer, first increases the pressure, and then maintains it in excess over that of the surrounding atmosphere. These winds travel along curved tracks, as computed according to Ferrel, and deposit a considerable portion of their moisture in the warmer regions of the planet. The remaining moisture continues on its course through general diffusion to the other pole, where a low pressure is found, due to its continual deposition in the form of snow. The earlier wind tracks are very definite like the earlier course of our West India hurricanes. It is demonstrated by means of the radii of their curvature that along them the winds must blow with hurricane velocity for weeks at a time, but, since the temperature fails to fall to the dew point, no clouds are seen except at the sunrise and sunset limbs of the planet. This leads us to believe that clouds, and perhaps rains, may occur nevertheless, with a lower temperature at night. Five such tracks in the northern and one in the southern hemisphere have been definitely located. Nearly all the planetary moisture in a state of transit, excepting during the two rainy seasons, is believed to be carried along these curved tracks, and vegetation presumably springs up in them as a result. On account of the small force of gravitation on the planet, the compression of its atmosphere decreases very slowly with the altitude, and this, affecting the temperature, in part accounts for its comparative freedom from cloud. Ferrel's theory demands curved canals only, but on the earth we find some narrow wind tracks that are absolutely straight. This is strikingly the case with certain of our western tornadoes, the width of whose tracks rarely exceeds a quarter of a mile, while the length in some cases has extended for three hundred miles and more, 1200 times their width (Monthly Weather Review, 1926, **54**, 58). Our thunder storms also travel in narrow straight tracks, but are wider.

This fourth explanation is the one to which I definitely adhere for the transfer of the water from pole to pole, and back again. It involves no artificial aid whatever, but I am nevertheless far from denying the possibility of the existence of animal life, and even of intelligent animal life upon our neighboring planet. In making this latter statement I am fully aware that I shall be severely criticized like my predecessors by some of my contemporaries. Until comparatively recently I have felt very definitely that we did not know enough about the surface conditions upon Mars to predicate intelligence there, although it was quite possible and perhaps probable that lower forms of animal life might exist. For many years we have been practically certain, in spite of the mathematicians, that the temperature of the planet was similar to that of our own. We based our assurance on the melting snow caps, on the proof that these caps could not be frozen carbon dioxide, and on the developing and vanishing green of the vegetation.

We are glad that the physicists have at last confirmed this knowledge, but the conclusions of some of them, as distinguished from their observations, are inaccurate and not to be depended on, as has already been pointed out by Coblentz. All that they could do was to determine the temperature of the soil combined with that of the upper Martian amosphere. The results obtained at Mount Wilson reduced to ordinary units are a continued temperature of —90° F. at the melting snow cap, a temperature of +9° F. at the equatorial limb, and +80° F. at the center of the disk (Annual Report of the Director for 1926, 104). According to the Pub. Astr. Soc. Pac. 1924, **36**, 271, however, the result +9° F. when first published was not the temperature at the limb, but "the mean value over a region extending inward to about one-fourth of the radius towards the center," that is to say, to about 50° from the limb. We shall perhaps be not far out of the way if we call it the temperature of a region at rather less than 25° from the limb. Further we find the statement "the actual temperature at the limb must be much lower than this." Near the limb, the effect of the cold upper atmosphere necessarily predominated, and they obtained a result far too low. Near the center of the disk the result must also have been too low, though to a less degree. With a nightly temperature such as these results imply, combined with a polar temperature as stated, the polar caps could never melt and disappear. But supposing for a moment that for some reason they could melt in the daytime, then with such a low temperature at night, they would always be in strikingly lower latitudes on the sunrise limb than they would on the sunset. This is not the case. Moreover with such extreme temperatures, and according to Mount Wilson *much lower* at night, even at the equator, than +9° F., vivid green vegetation such as we see could not possibly exist. It may be suggested here, however, that the temperature which they have deduced for the polar cap lies between the melting points of solidified ammonia gas and carbon dioxide. If they really believe that such temperatures obtain there, it might be well for them to look for the lines of these two gases on their spectrum plates, where they could hardly fail to be very marked.

But why go to such farfetched means of settling the temperature of the planet, when we have an absolutely reliable and accurate one by direct observation close at hand. On Mars as on the earth, regardless of atmospheric pressure, high or low, snow will melt at 32° F. As has been already shown in Report No. **31**, during the month of March on Mars, the snow is melting in latitude 60°, which corresponds on the earth to the latitude of Hudson Bay. During our March our snow is melting in latitudes 35° to 37°, corresponding to that of the states of Virginia and North Carolina. At this season of the year it is clear that these northern portions of Mars are far warmer than the same latitudes on the earth, and the same is true later in the season in the polar regions in Martian July and August, when the snow cap disappears. One of the main reasons for this difference between the two planets is believed to be the great density of the Martian atmosphere. That is to say, we

believe it contains many more molecules per square foot of surface than does that of the earth. This matter is taken up quite fully in our Report No. **30**, and need not be further dealt with here than to add that additional confirmation of this result is given by the very low limb temperatures recorded at Flagstaff and Mount Wilson. If there were no atmosphere at all, the temperature of the surface near the limb would not differ greatly from that at the center of the disk, as is clearly shown in the case of the moon, and should be much higher than the observations indicate. In other words the extremely low temperature found is of itself a conclusive proof of a dense atmosphere, such as occurs still more markedly in the case of the planet Jupiter. The yellow clouds on Mars, as compared with our white ones, can also only be accounted for by a very absorbtive atmosphere.

My observations and measures of Martian clouds in 1922 and the infra-red photographs of Dr. Wright in 1924 confirm one another in leading to the further conclusion that, in spite of the low gravitative force on Mars, the amospheric pressure at its surface must be at least as high, and pretty certainly materially higher than that on the earth at sea level. If so, this will largely neutralize the smaller proportion of free oxygen found in the Martian atmosphere. It is mainly these considerations of pressure and oxygen that have led me to modify my former view that we knew too little of the surface conditions to form any reliable opinion on the question of intelligent life on the planet. Now that we feel assured that the atmospheric conditions that obtain there are much the same as those found upon the earth, we feel much more at liberty to interpret what we see occurring there in the light of intelligent activities.

For the benefit of those persons who have never lived away from those countries which are dependent only on frequent rains, a few facts may be stated here that are well known to those who live in countries dependent largely or wholly on irrigation. (*a*) In a desert country like Egypt the desert extends to within a few yards of the river, except where the land is irrigated. (*b*) Unless one of two things happens, any country will become an absolute desert. Either the land must be occasionally soaked naturally by rain, or else it must be frequently completely flooded artificially by irrigation from overflowing ditches. A ditch or canal which cannot be made to overflow the surrounding region is of no use at all. A cloudy sky, a moist atmosphere, or a heavy dew is no better. (*c*) When the rain falls on some of our more marked desert regions, such for instance as occur in portions of South America, where an occasional shower of rain falls perhaps only once in three or four years, it brings forth a profuse growth of vegetation of which not a trace was previously seen. The plant life matures and fertilizes in a few weeks, and then dies down and disappears. (*d*) Terrestrial crops require at least one foot of annual rainfall, or even a little more, or two feet of irrigation. Double to treble these figures give plentiful crops.

Let us imagine the average depth of the snow over the whole polar cap when at its maximum diameter to be twelve feet. If melted this would give us one foot of water, enough if applied to the best advantage to water we will say an equal area of vegetation. Now compare the area of the polar cap in any drawing with the area of the Martian maria. It is scarcely one quarter their size, and we think we have been rather liberal as to the depth of snow. It is clear then that the maria must contain a good deal of water that is not supplied by the polar cap. It is also clear that this must be spread over its surface either by rainfall or by irrigation. There is no other way. At the coming apparition we expect to see the maria overspread in part by heavy clouds. Neither in 1922 nor in 1924 were they fully covered. The atmosphere of the whole planet was hazy, but that does not mean rain. To maintain the vegetation on the maria throughout the year where no visible clouds occur, *there must either be rains at night, or artificial irrigation*. There is no alternative. In our tropics the rains come in the afternoon. In the rainy season they may last through the night, and even into the morning. Presumably the reason they do not have afternoon clouds and rain on Mars is that the temperature is too high for the dew point. It is only at night that it reaches it, and that rains may occur. I rather think they do occur, but of course we don't know. Their heavy clouds seldom extend far past the terminator, perhaps never more than two hours, save in their two cloudy seasons.

The maria reach up to the southern polar cap when it first begins to melt, with certain lighter spots scattered here and there. This is clearly shown in Report No. **29**. As the cap melts the southern boundary of the maria retreats northerly. In 1924 some of these dark southern regions of the maria were visible for a large part of the twenty-four hours (see Report No. **34**, Figures 1, 4, 5, and 8). No trace of cloud was seen during that time on either limb, only the usual haze. The temporary darkening of these regions I believe was due to vegetation, and if not watered by rain, it must have been irrigated. An uncontrolled overflow of a stream, tearing away and redepositing the soil along a narrow track would not produce the large uniform grey areas that we observe.

We must now return to the question of the canals. Referring to our earlier discussion of Aethiops and Amenthes-Thoth, and their northern extensions, we have here described two parallel so-called canals 1000 miles apart, 200 to 300 miles wide, and straight or nearly so, proceeding from the melting southern snow cap for 4000 miles nearly due north. It is certain that they cannot be tornado tracks nor anything like them. Neither is it possible for the moisture to traverse their full length through the atmosphere propelled by the wind. In such a case they would necessarily be curved. If Dr. Trumpler's drawing and mine (Report No. **34**, Figures 17 and 29), confirmed further by Mr. Attkins' unpublished drawing, are correct, the main portion of the right hand canal, as distinguished from its faint cut-off, is somewhat curved, but it

is curved in the opposite direction to that required by Ferrel's theory. This makes it worse for the theory than if the canal were straight. It is certain therefore that the theory will not explain this particular marking. Both the right and left hand canals unite here in what is temporarily a very dark portion of the mare, which is known as the Tyrrhenum Sea. We can hardly doubt that this temporary excess of darkness is due to an abundance of vegetation, growing as the result of the excess of water brought to it by these southern canals, across the surface of the planet. But we must constantly remember that the word canal as applied to Mars does not mean a water canal, but merely a dark marking. Within these two dark markings water channels, natural or artificial, almost certainly exist. We believe that the maria occupy the lowest levels on Mars, and that water is brought to them, not by pumping, but by the simple force of gravity. Water flows to them from the southern polar cap, perhaps in some cases directly by natural channels. In certain other cases like that of these two canals, we have broad areas of vegetation through which invisible, partly natural, temporary streams must carry the life giving flood.

From the polar cap to the northern edge of the mare is in general about 2000 miles. Comparing it with the Ohio river, the latter is 1000 miles long and falls 500 feet. A drop of 1000 feet from the snow to the extreme northern edge of the mare would not, we may believe, be excessive on Mars. In flood the Ohio discharges three-quarters of a cubic mile of water per day, which is between thirty and forty times as much as when the river is low. The amount it can carry thus evidently depends mainly upon the supply. In 1924 the two canals were clearly seen for 150 days. If in that time we assume that they between them carried 200 cubic miles of water, and that the Tyrrhenum sea covered a quarter of a million square miles, they should have been able to cover it with water, not allowing for loss and for the vegetation upon their own banks, to a depth of four feet. An irrigation scheme of this sort, if developed with natural water channels as a subsidiary to the general planetary circulation, need require little artificial direction beyond what we give to such matters on the earth. Since the force of gravity on Mars is less than with us, the cross sections of the equivalent canals must obviously be greater. The development of many of the smaller canals such as those mapped in Thaumasia (Report No. **35**) might be similarly produced, but in some of these cases the canal itself is both straight and narrow, hardly a twentieth of its length, so that they certainly cannot be natural river channels, unless in order to carry the water as quickly as possible, and avoid seepage, evaporation, and flooding, they were artificially straightened.

The canal Bathys was one of the four most readily seen in Thaumasia, as is described and mapped in Report No. **35**. It was not detected either at Greenwich or Mount Wilson, but both the Meudon and Yerkes telescopes were able to show it very faintly (Figures 54 and 55). Indeed it was quite narrow—not over 25 miles in width. Its high visibility was

doubtless due to the fact that it was exceptionally dark. To Phillips and to Du Martheray (Figures 51 and 52) it was very clear. If we examine it on the map (Figure 50) we shall see that it starts from lake No. 4, towards which a dark canal proceeds from the snow cap according to Hamilton, Wilson, and Douglass (Figures 10, 11, and 33). Proceeding through Solis in Figure 50, it broadens like an elongated terrestrial lake where it is crossed by a similar canal coming down from Vitis. Possibly connecting also with lakes 5, 6, and 7 it crosses Thaumasia again, and joins the mare lying to the east of it. Here it seems to terminate. When traversing Solis it was clearly seen by Hamilton and myself (Figures 5 and 6) and somewhat more vaguely by Trumpler (Figure 8). At its crossing of eastern Thaumasia it was distinctly narrower and more difficult than Bathys, and the same remark applies to No. 15 as compared to Vitis. It is thought that this prolongation of Bathys, which we have called No. 12, could not have been more than 5 miles in width where it crossed eastern Thaumasia, which would have been the narrowest visible when the planet was at that distance, according to my measures made on artificial disks. Hamilton thought he saw a still narrower parallel canal extending along the southern edge of Nectar, and another along the northern, thus making a triple (Figure 4). Although I looked for them I could not see them, and since they were not otherwise confirmed, according to our rule they are not entered on our map. We have here it seems to me the most striking confirmation yet detected of my first "explanation," an irrigating ditch with vegetation growing along its sides. It is I think a little curious that I should have proposed the explanation, rejected it, later actually seen the ditch, and finally confirmed it by studies conducted at my own observatory!

Of course what we see is only the main water course. Invisible side ditches must serve for irrigation purposes, if that is what our drawings imply. Its straightness between the bends is remarkable. No sinuosities exist or, if they do, they must be extremely small, little if at all exceeding the width of the canal, as demonstrated in Report No. **6**. It is indeed possible that even where it is traversing Nectar it is merely a darker band of vegetation growing along the real water course, but supposing that that is the case, the canal itself must still be pretty wide, and comparable to one of our largest rivers, to carry all the water necessary. Its length is 1600 miles. Under these circumstances with a total drop of 800 feet, the water would readily flow through it by the force of gravity alone, but unless it were a straightened natural river course, executed originally by the water itself, an engineering work of such magnitude seems as impossible to us as the New York bridges would be to a bushman from central Africa.

Although we have thus now actually seen what our theory of 1893 described, yet it does not follow that all the straighter canals of Mars are constructed upon this principle. Something of the sort is evidently also shown in Figures 21, 22, 23, and 24, previously discussed, but the disagreement between the observers makes that case less satisfactory

than the other. The water apparently comes down on either side of Hellas, flows to the center of the disk, and then continues on to Euxinus. In the southern extension of the parallel canals Aethiops and Amenthes-Thoth no one suspected any central ditches. There may, however, have been narrower, natural, temporary streams, which, with side ditches, served to irrigate the land as long as there remained any water in them. Other similar northern as well as southern temporary circumpolar canals exist, which may be similarly explained as areas artificially irrigated by streams flowing under the influence of gravity.

The question now naturally arises, are there any canals in lower latitudes, which if dependent on irrigation would involve streams flowing sometimes in one direction and sometimes in the other. Such cases would naturally rule out the possibility of gravitation as a driving force. In the year 1916 the northern, and in 1924 the southern polar caps were each reduced to half their maximum dimensions. The water from them should then have been travelling in about the maximum volume southerly and northerly respectively. Comparing the drawings of these two years (Reports Nos. **17** and **34**) we find comparatively few of the prominent canals in common. Nepenthes was certainly different in shape and location. Thoth also seemed to have swung into a different position. Indeed the only prominent unchanged equatorial canals that I could identify in these two apparitions were Oxus and Gehon.

In addition to these, however, there are certainly a large number of long, fairly wide, faint temporary canals, lying in a more or less northeast and southwest direction between the equator and 60° north, whose existence cannot be explained by gravity. They do not seem to irrigate anything in particular, excepting themselves, but they do not appear to me to be sufficiently permanent in the general Martian circulation to make it necessary for us to explain them by an artificial pumping hypothesis. That hypothesis appears to me more improbable than the assumption that they are simply desert crops, planted so as to catch all the moisture possible as it travels during the semi-annual rainy seasons from pole to pole. On this hypothesis they simply are planted in those favorable locations where they will be most accessible, or otherwise useful to their owners, and it is assumed that larger areas are not needed. The only alternative seems to be to explain them as shower tracks existing quite independently of, and in opposition to, the general planetary circulation. Those that are curved would imply a circulation from south to north, while the northern polar cap is melting. The straight ones are too long to be explained in that way. That is certainly unsatisfactory, and I really see no reason why explanations involving intelligent life should be handicapped as against those that do not. Even supposing that the proposer had a bias in favor of the former, which is certainly believed not to be the case in this instance, it appears to me, supposing of course that we really desire an explanation, that that explanation should be tentatively accepted which involves the least and fewest improbabilities in the opinion of the reader, regardless of all

other considerations. Knowing as we do how on the earth life exists under the most diverse conditions, it would appear that on a planet where the surface conditions are so similar to our own the presence of intelligent life involves no improbability whatever. The narrow desert canals of Mars near longitude 180° depend for their moisture almost entirely on the melting of the northern polar cap, and are most visible between ⊙ 60° and ⊙ 150°, M. D. May 17 to August 38 (Report No. **31**, Figure 1). The desert canals near longitude 120° are fewer, but more permanent. They appear to depend more on the southern cap.

Turning now to our map of the planet (Report No. **36**, Figure 1) and starting with Hammonis, point No. 86, as a center, we notice four arcs of parallel canals stretching to the northwest of it. Indeed there may be a fifth one lying between stations 25 and 36. The inner arcs are the darkest and narrowest. This is perhaps the first time that we have detected anything approaching a systematic arrangement of the desert canals on Mars. Point No. 15, Acidalium, in the northern hemisphere, is located at the end of a promontory somewhat as Hammonis is in the southern. From it we see also five parallel lines of canals extending to the southwest of it. They are hardly arcs, and are not as conspicuous nor as easily seen on Mars as those we have associated with Hammonis. The arcs of Nectar-Bathys and Agathodaemon-Araxes are similarly placed with regard to lake No. 1 in Figure 50. The radiating canals about the circular Elysium, with the central dot, form a different arrangement altogether. These various systems account for the majority of the desert canals shown upon the map, and none of them suggest the idea of mere accident.

My present position is that I believe that most of the water on the planet stays permanently in the southern maria, and that most of the water from the melting polar caps is distributed through, and by means of the planet's dense atmosphere. The remainder of the water from the caps does not leave the planet's surface, but travels across it in invisible natural or artificial water courses to the nearest mare north or south, under the influence of gravitation. The vegetation of the planet is watered in part by rains at night, and during its two rainy seasons partly by rains in the daytime. If it receives any more water at all, it must necessarily come from artificial irrigation. On the whole adopting for the general circulation explanation number 4, for some of the smaller and shorter canals where necessary explanation number 1, and for the very faint desert canals explanation number 3, the canal system of Mars does not seem to me now so impossible of explanation as it did when I first began to study the planet in 1890. These three types of canals differ from one another also in their general appearance. Those produced under explanation number 4, of which Thoth-Nepenthes is an example, are curved and conspicuous. Those produced under explanation number 1, of which the southern prolongation of Amenthes is an example, are generally more or less straight, circumpolar, and conspicuous, while those produced under explanation number 3, the desert

canals, may be either straight or curved, but are generally inconspicuous. They are found almost exclusively in the northern hemisphere. Of course it is not suggested that these three explanations are final, but merely that they are I think the most probable ones that we have at the present time.

Apparently all the finer canals do actually require the assumption of artificial aid, and this becomes more striking in the case of the pentagon of 1892, and the star-shaped markings of 1907 and 1924. The last, it should be mentioned, was not a regular figure by any means as laid out on the planet, but only appeared so when seen from the plane of the earth's orbit. If it had been laid out as a regular star, it would have appeared so distorted to us that we probably should not have recognized its real shape. In case we assume that intelligent life exists on Mars, it does not seem wholly impossible that these temporary stars were intended as an announcement to us of its existence. The star of 1924 is best shown in the Pub. Astr. Soc. Pac. 1924, **36**, 266, Figure 6.

Private Observatory, Mandeville, Jamaica, B. W. I.
June 16, 1926.

## THE PROPER MOTION OF THE ANDROMEDA NEBULA.

($0^h\ 37^m.3$, $+40°\ 43'$)

By OLIVER J. LEE.

This great object, also known as N.G.C. 224 and M 31, has been the subject of many investigations. It subtends an angle of about 2° in its length and something less than half this amount in width. Naturally one might assume that it is nearer than most objects of its kind, and that its distance might be determined by direct methods. With this end in view Slocum, in 1913, began a series of plates with the 40-inch telescope, which, with one exposure of 15 to 30 minutes in good "seeing," record the central nucleus of the nebula as quite a star-like image. This series has been added to from time to time. Last year, measures of about twenty plates were combined in a standard solution for parallax and proper motion. It at once became apparent that the measures had been affected by the differences in the effective shape of the nuclear images on the plates, which, of course, were taken under a variety of atmospheric conditions. The plate residuals had a range of three times the normal range for stars. So far as a determination of the parallax of this object is concerned the results have no value. Besides, Hubble has recently concluded that its distance is of the order of 1,000,000 light years.

Earlier investigations of the parallax indicated values ranging from $-0''.11 \pm 0''.14$, by Franz with the heliometer, to $+0''.171 \pm 0''.051$, by Bohlin by photography. In 1918 van Maanen obtained a parallax of $+0''.004 \pm 0''.005$, while Lundmark by various indirect methods recently got $+0''.0000057$.

Some time before his death Professor Barnard called the writer's attention to two 40-inch plates, each with one exposure, taken by himself in 1908. Last year these were measured and at the same time two of the best recent plates, each carrying two exposures, were also remeasured. It seems desirable to give a short account at this time of the proper motions obtained.

The data for the four plates are:

| Plate | | Date | No. of Exp. | Exp. Time | Remarks. |
|---|---|---|---|---|---|
| Barnard | 58 | July 10, 1908 | 1 | 36$^m$ | Rather loose texture in image. |
| Barnard | 65 | July 19, 1908 | 1 | 31 | Firm image. |
| Lee | 5856 | Aug. 16, 1922 | 2 | 26 | Firm images. |
| Lee | 6501 | Oct. 13, 1924 | 2 | 25 | Loose texture. |

Some years ago about fifty stars in and about the nebula were investigated for proper motion as a step in the selection of comparison stars for the parallax of the nebula. Twelve of these were now used as standards in deriving the annual proper motions. The results are:

$$\mu_x = -0''.0172 \qquad \mu_y = +0''.0065$$

or $0''.0184$ in $291°$.

Van Maanen got $\mu_x = -0''.013 \pm 0''.011$.

Yerkes Observatory, July, 1926.

## AN INTERNATIONAL CO-OPERATION FOR THE PHOTOGRAPHIC STUDY OF CEPHEIDS.

By FRANCOIS C. HENROTEAU.

Perhaps the most stupendous of all celestial objects is the Milky Way, although so commonly known as to be taken for granted. Since all research in any branch of science must be adapted to a wider human experience than the mere obtaining of mathematical data, it is fortunate that the problem of the Cepheids has to do with this familiar spectacle. In fact the Milky Way is our whole sidereal universe, the millions of stars forming it being powerful suns many times larger than the earth, at unimaginable distances. Its appearance as a dim white band crossing the heavens is merely a matter of perspective, the stars being so far away as to be practically at the vanishing point. However, it is quite possible that these celestial bodies, usually seen as distant and incomprehensible points of light, may reveal potentialities little dreamed of by the amateur, and the fact that authentic knowledge must be gained through exact science and mathematical computations does not in any way diminish the inestimable benefit to be derived from more casual study.

There is no doubt that the super-giant stars, pseudo-cepheids and Cepheids, clustered more or less near the middle line of the Milky Way, constitute the very frame-work around which the universe is built.

When Goodricke in 1784 discovered the peculiar variation in light

of δ Cephei, he did not foresee that a large number of stars would later be found exhibiting similar variations of short duration, namely the Cepheids.

The problem offered by these stars has become one of the most important in astrophysics and their study has given rise to methods for sounding the utmost depths of the universe, one distinguished contribution being that of Dr. Harlow Shapley, director of Harvard College Observatory, and a most remarkable astronomical event is the finding, by Dr. Edwin P. Hubble, of Cepheids in spiral nebulae and the consequent revelation that the latter are stellar universes at such enormous distances that their light must travel millions of years to reach the earth.

The Cepheids are an important factor in determining distances beyond anything to be conceived; their nature is a mystery, but from the minute study of their light-curves, or curves representing the variation in magnitude with respect to time, may be formed a more definite basis for conjecture as to their probable constitution.

In the spring of 1920, at the Dominion Observatory, experiments were started by the writer to ascertain whether very short focus lenses might be used in determining accurate photographic light curves. In the skilled hands of Professor Barnard, Isaac Roberts, and others, very long exposures with such lenses have already given marvelous results as to the physical aspect of the Milky Way; they reveal enormous patches of nebulosity, among them the famous North America nebula, and dark currents such as featured in the regions of Scorpio and Sagittarius.

Stars are crowded together on these wonderful photographs, but it is a question whether their images are sufficiently well defined to justify measuring their photometric intensity.

With some lenses it is possible to obtain stars down to magnitudes 14 and 15, although plates are not exposed long enough to obtain Milky Way details. But in order to study their images for photometric purposes, the extrafocal method cannot be considered and diameter measurement of focal images is out of the question.

This difficulty may be overcome by measuring the magnitudes of a number of stars surrounding a variable on plates secured with modern longer-focus telescopes, the photographic images being perfectly round and susceptible of accurate micrometer investigation. Knowing their magnitudes these neighboring stars can then be used on a series of short-focus photographs to determine successive magnitudes of the variable; that is, estimate with a microscope which of the comparison stars has exactly the same shape, size, and intensity of darkness as the variable. The known magnitude of this particular star is the magnitude of the variable.

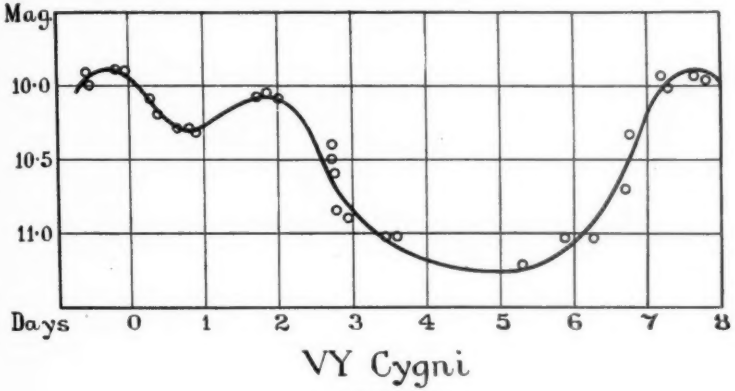
Plate XXIII (upper) reproduces a photograph taken with a short-focus camera; it contains a number of variable stars. A circle of ap-

proximately half an inch radius surrounding one of them contains its necessary comparison stars; these are very close on account of the extremely small scale of the photograph and can all be seen in the field of a low power microscope. An expert assistant can measure the magnitudes of one variable on a set of one hundred plates within a few hours.

More details concerning the method, particularly in regard to obtaining magnitudes of comparison stars, are given in the Dominion Observatory Publications, Vol. IX, No. 1, Chapter IX.

Plate XXIII (lower) illustrates the set of three cameras used at the Dominion Observatory.

In order to give an idea of the accuracy attained, the photographic light-curves of VY Cygni and WZ Cygni are given in Figures 1 and 2. The results rank with the best obtained by other methods and the following advantages may be noted as well:




VY Cygni

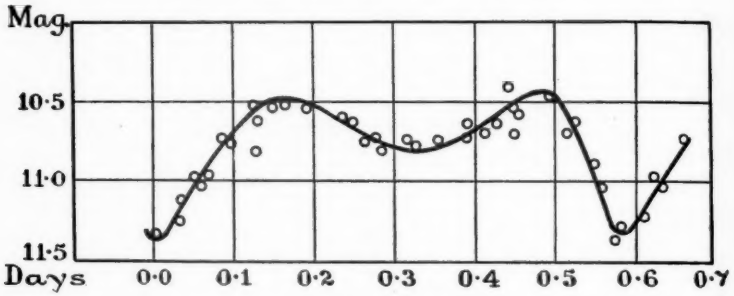
**FIG.1**

Given the magnitudes of the comparison stars the light-curves are practically not affected by personal equation, by the quality of the instrument used, or by the location of this instrument anywhere in the world.

Because plates can be used for a large number of variables and, also in other ways, the small scale of the field is of great value.

An interesting curve, determined at the Dominion Observatory, is that of XZ Cygni given in Figure 3. Here the observations do not seem to fit the curve as well as in Figures 1 and 2. The reason is obvious. All these observations belong to different cycles of this remarkable antalgol variable, and it has been shown that the shape of the curve changes from cycle to cycle. Shapley found this to be the case for RR Lyrae, Blazko in Moscow proved it for RW Draconis, XZ Cygni and other stars, and his work along these lines is noteworthy. For short-period Cepheids it becomes necessary to find out whether or not this is usually the case. In determining light-curves of these vari-

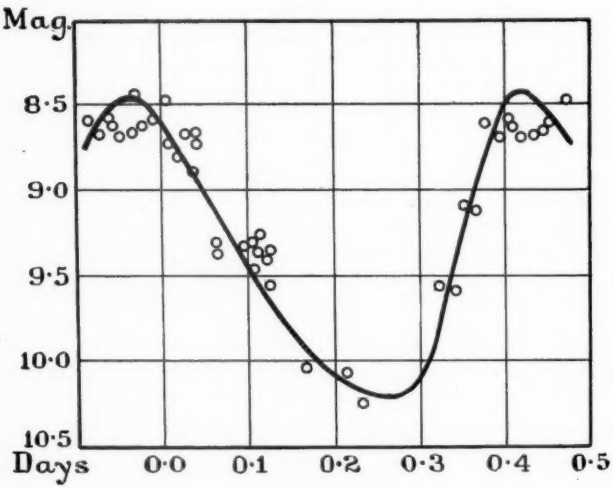
ables the general practice is to use observations scattered in different cycles, compute their phases according to the period and obtain a mean curve, evidently unsuitable for the purpose mentioned.




WZ Cygni

FIG. 2

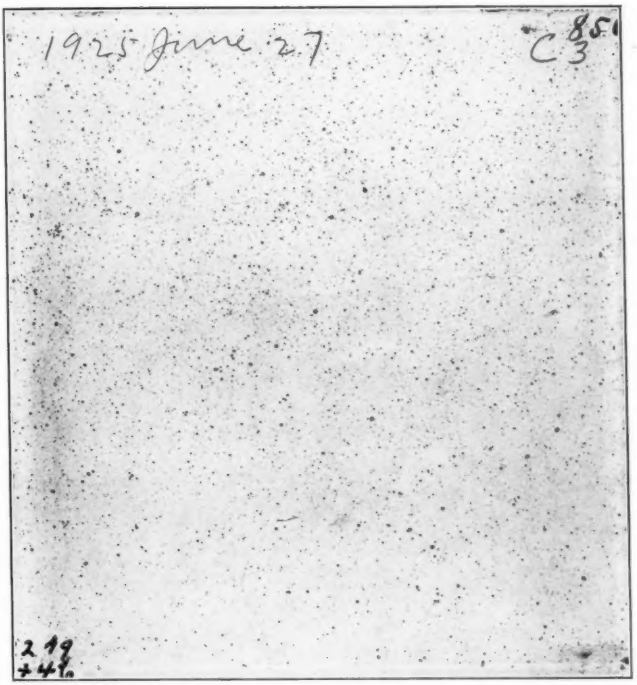
So far, it is not known what Cepheids are. They have been largely a matter of conjecture to amateurs, professional astronomers, and great




XZ Cygni

FIG. 3

mathematicians. The change in shape of a light-curve from cycle to cycle, being probably periodic, is an important factor to be considered




PHOTOGRAPH OF STAR-FIELD TAKEN WITH SHORT-FOCUS CAMERA.

SHORT-FOCUS CAMERAS.
Dominion Observatory, Ottawa.

in any working hypothesis, but this variation cannot be well determined since no continuous curve of a short-period Cepheid exists, that is, there is no curve determined from contiguous observations covering the same cycle.

To obtain really significant data it is necessary to plan continuous measurement of magnitudes, consecutive observations being separated by the shortest possible interval of time, for instance every half-hour twenty-four hours a day, unhindered by daylight, moonlight, cloudiness, or poor conditions of the atmosphere.

Clearly, this is possible only through world-wide co-operation, enlisting the good will and enthusiasm of scientists around the globe in an endeavor to solve a puzzling enigma.

For this purpose a plan was suggested by the writer at a meeting of the National Committee of Canada, to arrange this co-operation, involving observations with short-focus lenses in different longitudes, entirely around the world. Work on comparison stars would be divided between observatories equipped with larger photographic telescopes.

In this way accurate light-curves covering many series of complete individual cycles of all known Cepheids could be determined within a few years, and interesting problems developed indefinitely.

Later this plan was brought for consideration and approval before the meetings of the International Astronomical Union at Cambridge in 1925. In the report of the transactions of this body are the following resolutions:

> "That the Commission on Variable Stars directs the attention of observers to the considerable interest presented at the present time by the study of short period variables, especially by Cepheids; and it expresses the wish that observers located on widely different meridians should collaborate in the work through keeping in touch as closely as possible with the organizations which already pursue the study of Cepheids. It is further recommended that the two supplementary proposals of the Canadian National Committee with regard to the observations of variable stars be approved, namely:
>
> (a) That arrangements be made for co-operation in a joint programme of photographic observations on short period variables by observatories differing sufficiently in longitude to obtain complete light-curves. For the photographic curves the use is suggested of batteries of short-focus cameras, such as are already in use at Ottawa and being installed at Lisbon.
>
> (b) That arrangements be made for the determination of the photographic and photovisual magnitudes on the international scale of a sufficient number of comparison stars in the fields of variables. For this purpose, Miss Leavitt's fields might be used as a basis."

The large number of astronomers from all parts of the world, at Cambridge, presented unparalleled opportunity for organization. Previously, Professor Mascart, director of the Lyons Observatory in France and leader of an active European group of variable star observers, and Professor Da Costa Lobo, president of the National Committee of Portugal, had given assurance of their strong encouragement.

An informal meeting of about twenty scientists took place; this gathering was the beginning of our organization, and Professor Luplau-Janssen of Copenhagen, Denmark, was appointed secretary.

A definite program was outlined which has received the support of distinguished astronomers in many countries, and work has already been begun at different places.

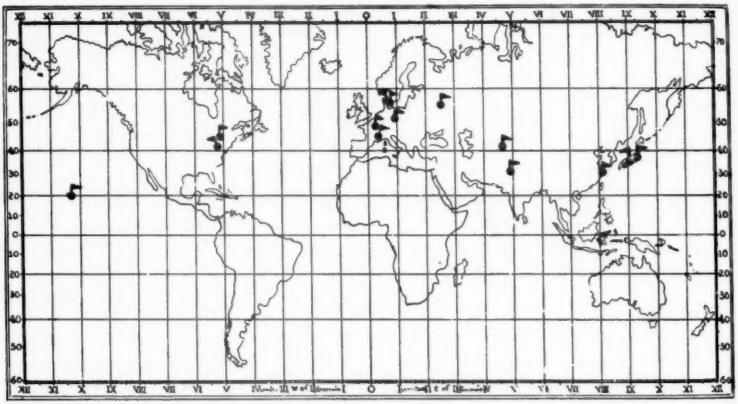


FIG. 4

So far the following observatories are participating in short-focus observations; they are indicated on Figure 4.

University of Hawaii.
Ithaca, N. Y.
Ottawa, Canada.
M. Delmotte, Masnières, France.
Lyons, France.
Copenhagen, Denmark.
M. Petersen, Denmark.
Berlin-Babelsberg, Germany.
Moscow, Russia.
Tashkent, Turkestan.
Lahore, India.
Zô-Sé, China.
Kyoto, Japan.
Tokyo, Japan.

Other stations are determining magnitudes of comparison stars, among them Ottawa, Copenhagen, and Teramo in Italy.

Lists of plates taken each month have already reached the writer. Among them the two given below indicate genuine interest and initiative.

PLATES TAKEN AT THE TASHKENT OBSERVATORY, TURKESTAN,
DURING THE MONTH OF MAY, 1926.

| No. | Julian Date | Expos. m | Observer | No. | Julian Date | Expos. m | Observer |
|---|---|---|---|---|---|---|---|
| 1 | 2424636.190 | 50 | S | 29 | 2424645.335 | 70 | Z |
| 2 | .257 | 60 | S | 30 | .397 | 80 | Z |
| 3 | 637.165 | 60 | Su | 31 | 647.185 | 70 | Sa |
| 4 | .209 | 60 | Su | 32 | 237 | 70 | Sa |
| 5 | .303 | 90 | S | 33 | 649.238 | 70 | Z |
| 6 | .378 | 60 | Z | 34 | 651.193 | 70 | S |
| 7 | .423 | 60 | Z | 35 | .247 | 70 | S |
| 8 | 638.215 | 70 | S | 36 | 652.253 | 70 | Sa |
| 9 | .277 | 70 | S | 37 | .303 | 70 | Sa |
| 10 | .343 | 65 | Z | 38 | .371 | 70 | Z |
| 11 | .393 | 60 | Z | 39 | .422 | 70 | Z |
| 12 | 640.218 | 70 | Z | 40 | 653.198 | 70 | S |
| 13 | .284 | 70 | Z | 41 | .259 | 70 | S |
| 14 | .344 | 70 | S | 42 | .314 | 70 | Su |
| 15 | .400 | 70 | S | 43 | .373 | 70 | Su |
| 16 | 641.233 | 80 | Su | 44 | .423 | 70 | Su |
| 17 | .305 | 80 | Su | 45 | 654.181 | 70 | Z |
| 18 | .366 | 80 | Su | 46 | .233 | 70 | Z |
| 19 | 642.234 | 80 | Sa | 47 | .291 | 70 | Z |
| 20 | .282 | 70 | Sa | 48 | .353 | 70 | Sa |
| 21 | 643.275 | 80 | Sa | 49 | .403 | 70 | Sa |
| 22 | .342 | 80 | Sa | 50 | 664.208 | 60 | Sa |
| 23 | .412 | 70 | Sa | 51 | .260 | 60 | Sa |
| 24 | 644.188 | 70 | S | 52 | .303 | 60 | Sa |
| 25 | .239 | 70 | S | 53 | .365 | 53 | Z |
| 26 | .330 | 80 | Su | 54 | 665.231 | 70 | S |
| 27 | 645.223 | 70 | Z | 55 | .282 | 70 | S |
| 28 | .276 | 70 | Z | | | | |

The names of the observers are:

S for M. Subbotin.
Sa for P. Savitsky.
Su for V. Surovzev.
Z for J. Zukervanik.

PLATES TAKEN AT THE TOKYO ASTRONOMICAL OBSERVATORY,
MITAKA, NEAR TOKYO, JAPAN,
DURING THE MONTHS OF APRIL, MAY, AND JUNE, 1926.
Communicated by Mr. K. Kinosita.

| No. | Julian Date | No. | Julian Date | No. | Julian Date |
|---|---|---|---|---|---|
| 1 | 2424625.136 | 12 | 2424641.117 | 24 | 2424671.082 |
| 2 | 627.241 | 13 | 643.096 | 25 | 673.117 p. |
| 3 | 628.282 | 14 | 645.139 | 26 | 674.248 |
| 4 | 632.04 | 15 | 646.065 p. | 27 | 675.095 |
| 5 | 633.074 p. | 16 | 648.156 | 28 | 676.065 |
| 6 | 635.280 p. | 17 | 652.009 p. | 29 | 677.085 |
| 7 | .998 | 18 | 652.246 p. | 30 | 682.057 |
| 8 | 637.027 | 19 | 656.006 | 31 | 683.055 |
| 9 | 638.025 | 20 | 662.039 p. | 32 | 684.067 |
| 10 | .999 | 21 | 666.120 p. | 33 | 686.136 |
| 11 | 640.119 | 22 | 668.241 | 34 | 691.123 p. |
| | | 23 | 670.105 | | |

The rainy season in Japan has prevented securing a larger number of plates. The letter p indicates poor plates.

Dominion Observatory, Ottawa, July 28, 1926.

## AN APARTMENT HOUSE OBSERVATORY.

By WILLIAM BRAID WHITE.

Everyone who cares for astronomy, even in the mildest way, has wished at some time for a telescope; and every one who has ever progressed as far as a telescope of even two inches aperture has wished that some day he might have an outfit something like what real astronomers have to work with. So much, at least, was my experience, and from what I have heard from the work of others all amateur astronomers are alike in hoping that one day they will be able to possess a really high-grade equipment, which will separate close doubles and show Uranus as something better than a rather ill-defined greenish blur.

Beginning with a two-inch glass I went forward to one of three inches, which ultimately was mounted equatorially upon a concrete pillar sunk in the ground in the garden at the side of our apartment house. The building itself is of the common two-family style so well known in Chicago and other mid-western cities, and covers a space of about 30x75 feet.

Discovering a few years ago how limited were the possibilities of a 3-inch aperture, I contracted for a fine 5-inch Alvan Clark lens, mounted equatorially on an iron pillar, and clock-driven. Just at this time, however, the owners of vacant land to the south and west of the house decided to begin building operations, with the result that within a few weeks my sky space was diminished by half, and the value of my little station on the ground almost wholly destroyed.

The only alternative was an escape to the roof of the building. This roof is flat and of the usual wooden rafter construction covered with tar and gravel. Of course it vibrates considerably when anyone walks over it. For a short time the new 5-inch telescope was mounted upon a heavy wooden tripod and tried out at various places upon the surface of the flat roof, but it soon became evident that something must be done to secure a firmer foundation for the mounting.

At this point I was fortunate in being able to secure the services of an extremely competent mechanic, Mr. Martin Pollak, living in the same building and interested for himself in star gazing. With his skill and enthusiasm, everything was made easy from the start and the arrangement illustrated herewith (Figure 1) was rapidly planned and built.

Close inspection will show that the little structure is built over a sort of bay which projects from the otherwise flat run of the eastern wall of the building. The length of the bay is twelve feet and the depth five feet. The first step in mounting the telescope was to find a firm foundation for the pillar, and this was accomplished by setting a

beam of heavy wood, well painted, across the bay from wall to wall. To steady it further, another piece of wooden beam of the same size was carried from the eastern wall of the bay at right angles and let into the main beam. Wooden struts were then nailed and screwed opposite the angles made by the meeting of the beams and the whole well mortared into place. When it was finished the structure was firm and motionless.

The pillar was then bolted on to the wooden cross thus formed at the precise center of meeting of the main and side beams.

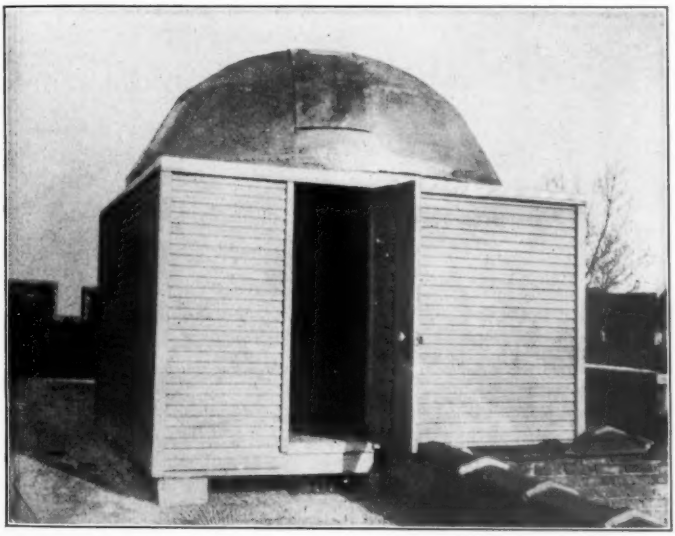


Figure 1. The Observatory with Dome Shutter in Place.

The illustration (Figure 1) shows the main beam projecting from under the wooden house which forms the observatory proper.

Mr. Pollak then proceeded to lay down wooden beams on the roof around the pillar, and on them he built the house, which is ten feet square, as shown. Four upright posts were fastened to the main beams and the wooden walls fastened to them. There are two thicknesses of boarding and the structure is well braced together. Special care was taken to see that the wooden floor should be raised well above the beams which carry the pillar and that no part of the observatory should touch these beams. Thus vibration is reduced until it is very slight and in general negligible.

When the walls had been raised, the question arose as to a roof. A revolving dome was of course the desideratum, but for a time it appeared that the thing was beyond our mechanical skill. While we were

thinking about it, Mr. Pollak contrived a sort of double trap-door laid flat upon the tops of the four walls, and an arrangement for opening the trap by means of long poles from within. This served us for some weeks, when its deficiencies became apparent and we determined to have a try at a dome.

What was done will be seen better by examining Figures 2 and 3. Mr. Pollak first laid out a ten-foot circle in chalk on the floor of our basement and then carefully and skilfully cut out with a saw a circle of wood to form the base of the dome and to take the rollers. These

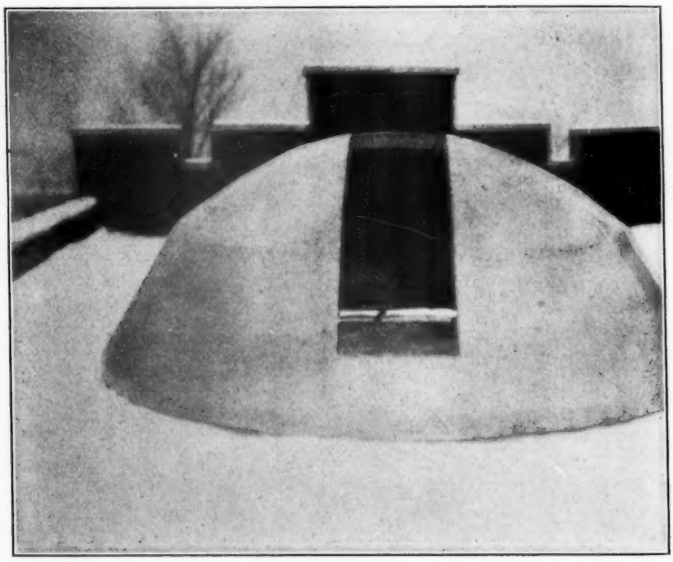


Figure 2. The Dome ready to be hoisted into Place.
(Note snow on roof.)

latter were obtained, together with an iron track for them to run in, through the kindness of Professor Parkhurst of Yerkes Observatory, since unhappily deceased, who had once used both in a private observatory of his own. The track served also as a kind of pattern and aided Mr. Pollak in constructing the circular wooden base aforementioned.

The required height of the dome was then obtained by the simple device of raising the telescope on its mounting until it pointed to the zenith and then taking a measurement which would make the dome clear it with some three inches to spare. Mr. Pollak then proceeded to cut out wooden rafters quadrant-shaped, nine in number. Seven of these were placed around the periphery of the base, and two were spaced 18 inches apart in order to leave place for the shutter of the dome.

The illustration (Figure 3) shows the inside of the completed dome and the arrangement of the quadrants. Mr. Pollak is the man standing out in front holding one of two slats which were nailed temporarily on to the bottom of the dome in order to facilitate the job of raising it to the roof from the ground below. The pieces of wood were simply fastened together by means of angle irons and bolts with nuts and washers. The job was then completed by cutting to shape and nailing on pieces of light sheet tin.

Figure 3. The Dome tilted backwards to show Construction.

To carry the dome, the trap door was taken off the house and in its place was fastened, to the four side posts, a wooden platform four inches thick, cut in the shape of a ten-foot circle inscribed in a square. The illustrations show how this platform fits neatly on to the top of the house. It was painted, and then covered with sheet tin of the same thinness. All joints of the tin, both on platform and dome, were then soldered.

The dome was now easily hoisted up into place and its rollers (large

castors) six in number dropped down on to the iron track, three inches wide with half-inch flanges, which I obtained from Professor Parkhurst and which came in sections fitting on to each other. This track had been screwed down on to the platform before the dome was hoisted into place.

All that remained now was to arrange for the shutter, put handles in place for turning the dome, and paint everything.

The shutter was the toughest job of all. It was made to shape just as if it were part of the dome, with wooden quadrants and a covering of thicker tin, but we had much discussion as to how to fit it on to the dome in a practical way. After many experiments, made before the dome was hoisted into place, Mr. Pollak finally concluded to have the shutter removable entirely from the dome, when it was to be opened, instead of trying to put it on a hinge or to make it slide. He therefore built the tin cover to overlap the sides of the slot left in the dome, and fastened it into place with hooks from the inside. Handles were also put on for grasping the shutter from the inside. To remove the shutter, one simply unfastens the hooks which hold it tight, grasps the two handles and lifts the entire shutter inside the dome, where it can be left on the floor, or else, if desired, taken outside during observations. It is light enough to be easily handled and the arrangement is simple, cheap, and convenient.

Within the little observatory, which is only ten feet square, are contained the mounted telescope, a cupboard for oculars, tools, etc.; a set of shelves for star catalogues and charts; a sidereal clock and an observing chair, as well as a small step ladder for convenience in reading the circles and handling the shutter. Electric light has been put in to illuminate the circles and to throw a light on the little table, equipped with castors, which contains space for charts, books and note-taking paraphernalia. This table, eighteen inches square with a ledge around it to prevent pencils, etc., from falling off in the dark, can be rolled around on the floor anywhere without inconvenience, in the dark as well as under illumination. Figure 4 shows some details.

The observing chair is worthy of a glance too. It was also built by Mr. Pollak, after a suggestion contained in Chambers' *Handbook of Astronomy,* Volume 2. It consists essentially of a stoutly built step ladder on rollers, with the steps arranged to fold backwards when required. Any step can be used to sit on and all steps above it folded back to make a sort of rest for the observer. As the distance between steps is necessarily some eight inches, a small additional step is provided which may be placed upon any step to raise the observer four inches more. Thus almost any position of the telescope can be employed conveniently.

Our apartment house observatory stands alone, I imagine, for the originality of the mounting and for the cheapness and simplicity of the dome. Experience shows that the whole thing works perfectly and

that it affords all the conveniences, on its small scale of a regular professional observatory. The house proper, which was put up with its trap door arrangement last summer, has stood through all the storms of winter so far without budging an inch, although it is secured to the roof only by its own weight and by some wooden struts between it and the brick walls. As explained before, any more secure fastening was avoided in order to prevent vibration of the telescope mounting.

The cost of the original house, including materials and labor, was

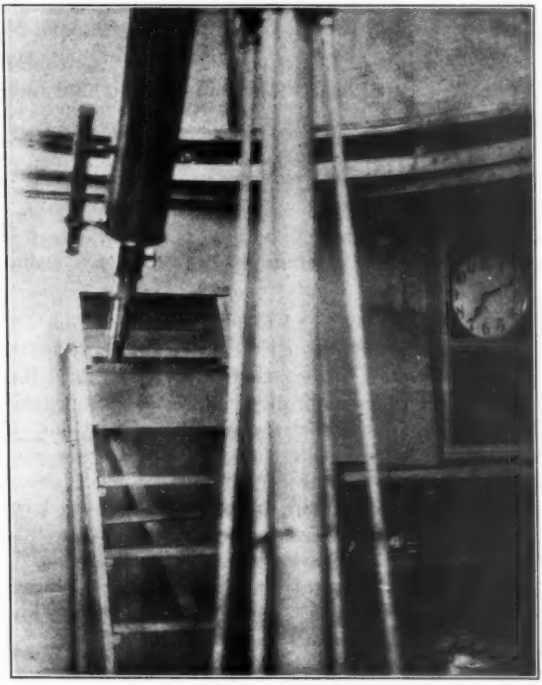


Figure 4. Interior of the Observatory showing Pillar, Clock, and Observing Chair.

approximately $180, and of the dome another $150; or a total of $330. It is hard to imagine anything more moderate in price. The whole structure is water and wind proof, has been well painted inside and out, and keeps books, charts, and all other delicate contents, dry and clean. There is a small window in one side and a door opening to the south. The dome was painted inside dark grey and outside with bronze powder varnished over, so that under the rays of the sun it has quite the appearance of burnished copper.

5149 Agatite Avenue, Chicago.

## ASTROLOGY.

By JOSEPH M. SYNNERDAHL.

Astrology is the pretended science or art of fortelling events by means of the positions or aspects of the heavenly bodies. According to the class of events to which it gives attention it has been divided into four groups.

1. Judicial Astrology, or Nativities, the art of forseeing from the figure of the heavens at the birth of an individual his fate and character.

2. Mundane Astrology, relating to the circumstances of nations, such as wars, pestilences, earthquakes, etc.

3. Atmospheric Astrology, relating to meteorological problems, weather predictions, etc.

4. Horary Astrology, foretelling at any period when an individual may be anxious about the matter or the result of any business or circumstance whatever.

Astrology is a most ancient and honorable superstition. Practically all the ancient world believed in it except a good many of the Greeks. It was practically universal in the Middle Ages, and until the Copernican system was thoroughly established; and even now probably a large majority of all the inhabitants of the world, civilized and uncivilized, have faith in at least some of the claims of this pseudo-science. The Chinese, the Hindus, and all the Mohammedans place almost implicit reliance in the predictions of the astrologer; and a very large proportion of Christians have one or two pet astrological superstitions which they defend with more or less earnestness.

It has been an integral part of many religions and traces of it are found in nearly all of them. It has left traces in the art, architecture, language, and literature, of nearly every nation. It has been nearly as universal as religion itself.

The belief is prehistoric that terrestrial affairs are in some way governed by the heavenly bodies, or at least that there is such a correspondence between planetary positions and motions and events on the earth that a knowledge of one will lead to a knowledge of the other. It was probably found out very early that there was at least some sort of regularity in the motions of the sun, moon, and planets; and when this was once recognized a mighty impulse was given to a further study of them in the hope of establishing rules and formulas by which these motions of the starry host could be made to give up the secrets of the fates (Babylonian).

Up to the end of the Middle Ages this was the main influence in the study of Astronomy, just as for centuries the study of Alchemy, which

sought the elixir of life and the philosopher's stone, was the only impulse toward the study of Chemistry. These false sciences have done the real sciences, their children, good service. The progress from the old to the new has been in accordance with the true scientific method. A poor hypothesis is vastly better than none at all. Bacon to the contrary notwithstanding, no great step in science has been made by simply collecting all the facts together, and then finding the law connecting them so apparent as to be plain to a very ordinary intellect. In the very decision as to the facts to be collected there must be some as yet unproved hypothesis. The hypothesis may be very faulty, and the observations made to prove it may lead to its complete disproof; but even that is a gain, and the total result is to increase our knowledge. (The rulers of the earth endowed observatories so that their astrologers might get better material for predicting the future; and the observations made by these astrologers served the best purpose in overthrowing their theories.) The most noted astrologers of their day were Tycho Brahe and Kepler. The former made the observations from which the latter deduced his famous laws of planetary motion, and from these last Newton deduced the law of gravitation. At present we do not believe, at least consciously, in Astrology, but it is not the part of wisdom in us to decry too earnestly the old belief, or to consider ourselves so vastly superior in intellect to our ancestors because of our freedom from such superstitions. Many things which now go without question will probably seem as absurd to Macaulay's New Zealander.

In order to get a just appreciation of the causes which led to a belief in Astrology we must take into account the state of knowledge of the time and the general attitude of mind in regard to the explanation of natural phenomena. The science flourished chiefly in the Middle Ages and came then to be more nearly a real science than at any other time. The philosophy of Aristotle held complete sway over men's minds, but they generally forgot that he had been the most acute observer of phenomena of nature as well as the greatest philosopher of his age.

There was scarcely a trace of an idea of the true relations of the solar system, although Ptolemy's empirical theory enabled them to predict the positions of the heavenly bodies within reasonable limits of error. It was a sort of a geometric application of Fournier's Theoren so much used nowadays under similar circumstances, when a physical explanation of a phenomenon is not at hand. But in using this theory they completely lost sight of the relative importance of the various members of the solar system; the earth was the center about which all else revolved, the sun and moon gave us our light, and the sun gave us heat, but that it was of any great size as compared with the earth was completely unthought. The moon evidently caused or was in some way connected with them, and certain vital phenomena seemed to be connected with lunar motion. The planets wandered around their

irregularly regular paths among the stars, and countless myriads of stars performed their daily and yearly round with unfailing regularity.

Meanwhile man was the end and aim of creation and everything was made in some way for his benefit. The earth was fixed in the center of the universe and the sun, moon, planets, and stars were in some way subservient to it. Granting the several terrestrial phenomena which were known to be under the control of the heavenly bodies, is it any wonder that they looked for others? And when such things are looked for it is not very difficult to find instances of apparent coincidence. Unusual events are happening to men all the time. The planets arrange themselves in peculiar groupings continually. You have probably all known persons who thought they had proven from personal experience that the changes in the weather correspond to changes in the moon, etc.

Having settled therefore that the science is entirely reasonable, it is next in order to inquire how the astrologer makes his predictions. It is a subject very intricate in details, and I do not feel that I am by any means a master of many of them, but I can give a general outline.

The portion of the heavens chiefly concerned is the zodiac, that zone of the celestial sphere 8° on each side of the ecliptic within which the wanderers of the solar system go through with their motions; and it is with these wanderers, the planets, including the sun and moon, their positions with reference to each other and their positions in the sky, that the astrologer had most to do. He did not commune very much with the stars in general although a few near the ecliptic were occasionally taken into account. Also any strange or unusual phenomenon was supposed to have some bearing on mortal affairs.

Eclipses, new stars, comets, meteoric showers were all supposed to portend something unusual, in most cases some evil to great ones of earth.

The sign of the zodiac rising at the time of birth possessed an influence over the shape of the body and the disposition. Thus the sign Aries rising at the moment of birth tended to produce "A dry lean body, middle stature, strong limbs, large bones, long and meager face, sharp sight, neck rather long and scraggy, dark eyebrows, swarthy complexion, hair reddish and wiry, thick shoulders; disposition angry and violent as the ram." And so on for the remaining eleven. The influences of the signs were, however, not so strong as the influences of the planets, the disposition depending chiefly on the moon and Mercury.

In preparing to peep into futurity the first thing that the astrologer did was to "erect a figure of the heavens" for the moment of birth of the "native," as he was called, (Judicial Astrology) or the moment when the question to be settled was asked (Horary Astrology).

This figure of the heavens was nothing but a conventionalized representation of the ecliptic with the planets placed in their proper places according to the almanac.

The most important position of all was the point of the ecliptic which was just rising; this called the "ascendant," with the "mid-heaven," the "descendent," and the "imum coeli," or lowest point constituted the "angles." Each of the four quadrants was divided into three houses, the houses being numbered from one to twelve, the cusp, or beginning of the first house being the ascendant and the numbering running counter-clock-wise.

Each house had its peculiar significance.

1. House of Fate, a favorable star in this house announcing a happy fate, and unfavorable one the reverse.
2. Riches and possessions.
3. Brothers, friends, and journeys.
4. Parents.
5. Children (bona fortuna).
6. Servants, health, women, etc. (mala fortuna).
7. Marriage.
8. Death (only the moon favorable).
9. Religion and journeys.
10. Life, deeds, country, residence, office dignity, etc.
11. Friends, hopes, etc.
12. Enemies.

The planets were, however, the chief sources of information for the astrologer, and this in several different and often incompatible ways. Each planet has its own peculiar nature, and exerted an influence according to its position with reference to the ecliptic, to the horoscope, and to the other planets. As there were seven of these bodies according to the old astrologers, Saturn, Jupiter, Mars, Sun, Venus, Mercury, Moon, they seldom or never told a consistent story, and the astrologer had a fine task to reconcile all the prognostications to be derived from the whole lot, and the practice of the art afforded a great opportunity for reconciling discrepancies.

To begin with, the natures of the planets, commencing with Uranus which has been received into the astrological system within the last hundred years, are here given. (I have not found any reference to Neptune in any astrological work. It has been known less than eighty years, and that is hardly long enough for its influence to be determined.)

Uranus is by nature extremely evil. "If ascending at the time of birth it causes the native to be of very eccentric disposition, pursuing extraordinary and uncommon objects; one who despises the track of custom and is very abrupt in manner. Whatever good he may produce, when aspected or situated, will be of a sudden description and quite out of the common course of things. Persons whose minds are influenced by this planet are unsettled in life, partial to travelling, witnessing many strange scenes, very romantic and extraordinary in their ideas, and given to the study of antiquity; yet likely to strike out many novelties."

Saturn is far more evil than Uranus; he is called the Greater Infortune and is undoubtedly the cause (subservient to the will of Providence) of the greater portion of human suffering. When he is rising or setting at birth the person born will suffer much lingering sickness and be very subject to blows, bruises, and falls. If he be on the meridian or coming to the meridian he causes perpetual trouble and

disgrace; all the native's affairs go wrong, and, unless there be some very strong aspects of other planets to counteract this evil position, the native is the complete child of misfortune.

Jupiter is by nature eminently beneficent, and he is called the Greater Fortune. When rising at birth he confers much strength of constitution enabling the native to overcome very evil directions which would otherwise prove fatal. The persons under his influence are healthy, cheerful, and jovial in disposition, and quite free from fraud or meanness of any kind. If ascending the native will be extremely wealthy and arrive at distinction. Queen Victoria and the Duke of Wellington were born under his influence.

Mars is a very evil planet but unlike Saturn. He causes violent diseases, accidents, burns, etc. His natives are rash, quarrelsome, ruthless. If he is on the meridian at birth the native is war-like. George III was under Mars.

Venus is beneficent but not as strong as Jupiter. Assists to strengthen the constitution if ascending at birth, but also gives a proneness to dissipation which may injure the health. George IV belongs to her.

Mercury is the chief ruler of the mental faculties but their trend is chiefly shown by his positions with respect to the other planets. If near the sun the native never has much scientific ability. If evilly aspected to other planets, Mercury may cause insanity. This is the cause of the insanity of George III.

Sun has small specific influence but seems to act like Mars. If in good aspect to that planet he causes pride. The same in respect to the moon causes success in life; if in evil aspect he gives rashness and injures the native's fortune. When any planet is near the sun its influence is in great measure destroyed.

The moon is very powerful. Persons born during an eclipse are weakly and never live very long. The moon has certainly at all times much to do with the native's constitution, and if she be much afflicted or evilly placed, his health will rarely be good and his fortune will be poor. The animal propensities depend almost wholly upon the moon and if she be afflicted the native will be idle and given to drinking, gluttony, and debauchery.

I have used the term "aspect" several times. The term refers to the relative position of two bodies or points in the horoscope. The aspects are: Semi-sextile (30°), Sextile (60°), Quintile (72°), Quadrature (90°), Trine (120°), Biquintile (144°), and opposition (180°).

The semi-sextile, sextile, quintile, trine, and biquintile, are all good, the strongest being the trine. And planets situated at or near such distances from each other act beneficially for the native. If the aspect be incomplete the effect is not so powerful, but will take effect at that period of life when it becomes complete.

Evil aspects are the semi-square, square, and opposition. The most powerful is opposition.

The planets are especially strong when they are in their own "houses," that is, in the signs of the zodiac appropriated to each. Each planet except Uranus has two signs for his houses except the sun and moon, which have only one each. Uranus being a latecomer has as far as I can find been unprovided for. I suppose he has to board around, like some mortals we all know.

The duration of life is determined by the sun if in a "hylegiacal" place, next the moon if so situated; or if neither be properly placed, the degree ascending. The hyleg supported by good planets and without affliction (evil aspects of evil planets) gives long life.

The fortune of the native is determined by a point, "pars fortuna," the same distance from the ascendant as the moon is from the sun. It is not much used in nativities.

In determining the time when any expected event was to happen there was no very settled agreement. Various methods were used, one of the principal methods was by so-called "directions." The direction of one point from another was variously estimated. One way was by finding the arc of the equator included between circles drawn through the north and south points of the horizon and the bodies. The number of days it would take for the bodies to get into a given position would indicate the number of years before the effect of that configuration would be felt. Kepler says, if the sun be at a certain place in the zodiac at this moment and a planet afterwards comes to an important place, it should be computed how many days after the birth it took the sun to reach that place, and the number of days corresponds with the number of years which will elapse from the birth before the power of that configuration will be felt.

I have given a few of the leading principles by which astrological prognostications are made, and as far as I have gone there seems to be a pretty general agreement among the writers on the subject. But when one goes into more minute detail there is by no means the same unanimity of opinion. There were different schools of astrology just as there are different schools of philosophy, and differences of opinion among devotees of any other branch of learning. Even in erecting a figure of the heavens, where one might expect unanimity, as it involves nothing beyond getting down on paper the exact positions of the heavenly bodies concerned, there were great differences. The division of the zodiac into houses was sometimes made by circles through the zenith, sometimes by circles through the north and south points on the horizon, sometimes by circles through the pole. All, however, seem to have agreed on the four main points, ascendens, medium coeli, descendens, and imum coeli.

But when it came to the interpretation of the figure there was frequently a wide discrepancy. The Arabian astrologers were generally regarded by their European brethren as somewhat fanciful, as well as prone to go beyond the limits of accepted probability. Toward the end

of the astrologer's reign the greatest minds did not place as great confidence in their results as did the early cultivators of the science. Tycho Brahe toward the close of his life seemed to think that only a comparatively slight value was to be placed on his predictions. Kepler, his successor, was a great practitioner of the art, in fact making a good share of his living by it. He seems to have been in a way sincere, yet there are indications of doubt. He says in one place, "Astrology is indeed a foolish little daughter, but, *lieber Gott,* how would her most sensible mother, Astronomy, live if she were bereft of this foolish daughter?"

And when one looks into the subject at all carefully the wonder is that clear-headed men did not give up attempting to make out anything from it long before they did, or before they gave up the belief in its general inherent probability. The elements on which to base a prediction grew in number so that the difficulty of determining what was the most probable course of events became almost insurmountable, owing to the number of things which were supposed to influence the future. It becomes an almost hopeless task to assign the relative degree of importance to auguries—more or less conflicting. Zadkiel begins his "Rule to Judge of the person" as follows: "Consider the planets in the ascendant, if there be any, and also the planets throw an aspect to the cusp of the ascendant; and make a judicious mixture of these."

"Aye, there's the rub." Judicious mixing is not an easy matter, and the personal equation of the astrologer could not but come in, and make his results differ from his brother's. The planets fight against each other and promise all sorts of divers fates to the poor native. One tries to enrich him, another bids him expect poverty; one gives him long life, another cuts him off in infancy; one portends honor, another, disgrace. It is the rarest thing possible when the horoscope is even in a small degree self-consistent. The astrologer must often have been in the condition of mind of the modern juryman in trying to make up his mind on the medical aspect of the case after hearing all the testimony of the medical experts.

If a man tries to base his predictions on the rules laid down by any one astrologer, he may have some chance of making some consistent result; but as soon as he begins to try to reconcile this result with what would be obtained by following some other man, he finds that things will not be reconciled. The art of prediction from planetary positions to mundane events never arrived at the dignity of an exact science.

Judicial, Mundane, and Horary Astrology are no longer honored by civilized peoples although here and there believers are to be found, and one can scarcely find any large city newspaper without finding several advertisements of astrologers. It is needless to say that most of these practitioners of the art do not know anything about it, and do not know enough to "erect a figure of the heavens," much less how to interpret it when it is made. They are ignorant practitioners of a false art, and

what they get out of it is not of interest even to the student who is working up the subject.

But here and there may be found a real believer, who has enough knowledge of astronomy to use a modern almanac, and enough knowledge of the history of the art to apply in some degree the old rules. Such a case is perhaps as worthy of study, as many another case of intellectual aberration which has affected a multitude of mankind. Books have appeared in several European countries in recent years written by men who seemingly were perfectly convinced of the truth of astrology, and who wrote not for purpose of gain or self-advertisement, but with as earnest a spirit of propagandism as any reformer in a legitimate line, and who on all other subjects seem perfectly sane.

Had these books been written four hundred years ago, their writers would have received great praise and honor. Every astronomer and mathematician was more or less of an astrologer. The names were practically synonomous; and most physicians and biologists dabbled more or less in the art. The unbeliever in astrology was about as rare as the absolute atheist today.

There is one branch of astrology, however, which still flourishes today with an immense number of believers. I refer to Atmospheric Astrology. The idea here is that in some way the positions of the sun, moon, and planets have an influence on the various changes in our atmosphere usually studied under the name of Meteorology.

Of course I do not mean to assert that the bodies of the solar system have no influence on our weather, and that the attempt to find relations between extra-terrestrial conditions and terrestrial weather is as foolish as predicting the future for a new born babe by planetary positions. The problem is on an entirely different plane, and has much greater inherent probability. In fact I believe that all of our weather comes primarily from our sun. The great seasonal changes and connection of auroral displays with sun spots are only two of a great number of instances of known connection which might be cited. As to any influence of moon or planets, however, none has yet been ascertained which will bear any rigorous scrutiny, and as far as appearances go there is small probability that any will be found in the future.

The term Atmospheric Astrology would perhaps be better defined as the pretended art of predicting the weather by means of the apparent positions of the planets with reference to each other and to the sun and moon, and it is to be regarded as entirely distinct from the really scientific study of the relation of the sun to the earth's atmosphere.

All the weather predictions in our patent medicine almanacs are made by atmospheric astrology when they are not mere guess-work; and all of our modern weather prophets are atmospheric astrologers. Wiggins, the Canadian who scared the colored population of the Gulf States into convulsions some years ago, and who excited a great deal of interest in persons who should have known better, was an atmospheric astrologer.

He claimed to base his predictions on planetary motions, and especially on the motion of the hypothetical planet Vulcan nearer the sun than Mercury. This unknown planet is a great boon to astrologers, because they can make its position, period, and distance fit almost any set of conditions they desire, and others besides Wiggins set great store by it. However, it is pretty well ascertained that there is no such planet, although there may be a ring of asteroids inside the orbit of Mercury. Some years ago Professor Tice of St. Louis was the great weather prophet of the country, and his predictions were largely based on the supposed positions of Vulcan. Then came another resident of St. Louis, Rev. Ira Hicks, and his almanacs were sent out by the hundred thousand. He also had a great deal to say about Vulcan, and laid a great deal of our bad weather to that depraved planet. At present no outstanding figure has appeared in this field as the pretended art has fallen into such disrepute that its cultivation tends to discredit the protagonist.

Our modern atmospheric astrologers are not very communicative about their methods of predictions, they usually hold them as secret as the methods of compounding the patent medicines which they frequently advertise, possibly for the same reason. A little light on either would probably weaken the faith of their dupes.

The belief that changes in the weather are occasioned by changes in the moon seems as thoroughly ingrained in the minds of many persons as is their faith in anything that could be mentioned; and yet there is not a particle of scientific evidence to support it. How many of you think of the old adage about seeing the new moon over the left shoulder, when you first see the new moon? Root crops must be planted in the dark of the moon according to the belief of many a farmer. It is to be a wet moon because the horns are so pointed as to let out all of the water, etc., etc. The list of these astrological superstitions might be multiplied indefinitely, but I will not worry you with a further enumeration.

One needs to know something about astrology to read intelligently much of the mediaeval literature. It had to be reckoned among the forces which influenced men in those times. I am credibly informed that Dante makes a good many allusions to it. The astrologer Lilly was cited to appear before a parliamentary commission to give evidence in regard to a prediction of the great fire of London. Before that time the position of mathematics or astrology was a very common one in many of the courts of Europe.

It shows in many ways in our language where one could scarcely expect to find it. A great many words are etymologically astrological. We speak of the ascendancy of genius, and of a disastrous defeat. Our dispositions are saturnine, or jovial, or mercurial. The physician still heads his prescription with an invocation to Jupiter the greater fortune; and in numberless other ways the dead science still lives. Traces con-

tinually show themselves where one would perhaps least expect them.

Well, it has had its day and now no thoroughly educated person believes in it. Like many other superstitions it is relegated to the dust heap of hopelessly discredited beliefs. But we must not be too hard on our ancestors for their faith in it. It was by no means wholly bad. It kept alive the knowledge of Astronomy when nothing else would. And the idea of planetary influence once started, nothing but a better knowledge of the real facts of Astronomy could disprove it. And this addition to our stock of knowledge was in no small degree made by men, who were seeking it for the benefit of Astrology or who gained their livelihood by the practice of making horoscopes.

Loyola University, Chicago, Ill.

## TIME MEASURED GRAPHICALLY.

By FREDERIC R. HONEY.

The great variations in the lengths of days and nights—due to the inclination of the earth's axis—may be measured graphically. The uniformity of the earth's rotation provides a perfect time piece for astronomical observations; and the observer's parallel of latitude may be represented as a twenty-four hour sidereal clock face which will give the interval in sidereal time between sunrise and sunset. It is noted, however, that a graphic representation of time is made on the assumption that the earth is deprived of its atmosphere; and the interval between the appearance and disappearance of the sun's center on the horizon must be increased both at sunrise and sunset by the increment due to refraction.

Figure 1 is a projection of the northern hemisphere on a plane which is parallel to the earth's axis and perpendicular to the plane of its orbit at the date of the summer solstice when the earth is in longitude 270°. It represents the equator, the tropic, and the parallels of Washington, Greenwich, and Helsingfors, the last being the parallel of the most northerly observatory in the world. The arrow shows the direction of rotation; and the great circle, which divides the illuminated from the shadow area, is the locus of observers at sunrise for all latitudes.

In Figure 2, the projection on the plane of the orbit, one-half of the great circle is the locus of observers at sunset; and the other half, that of observers at sunrise. This figure shows the variation of that part of each orbit which is illuminated as compared with that which falls within the shadow area, the variations increasing with the latitude.

Figure 3 is the projection of the parallel of Helsingfors on an enlarged scale converted into a sidereal clock face showing the hours and half hours.

Figure 4 shows the construction of one-quarter of an ellipse by points. The circles are described with radii $op'$ and $op$ respectively equal to the semi-major and semi-minor axes. From $p'$ draw $p'P$ parallel to the minor axis; and from $p$ draw $pP$ parallel to the major axis, intersecting the former at $P$, a point on the ellipse. In the same way any other point $Q$ may be plotted. In Figure 3 the points selected

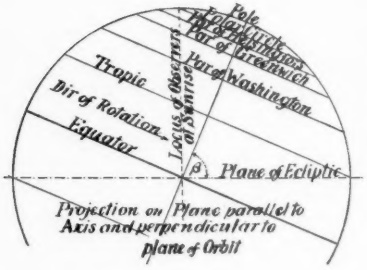



Figure 1.

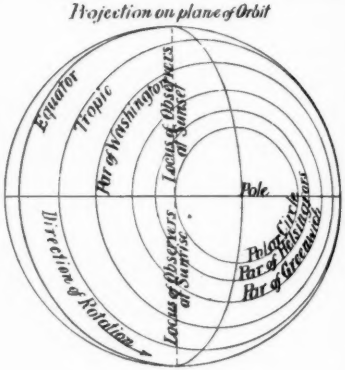



Figure 2.

are those which mark the hours and half hours. It will be noted that, since the curve is symmetrical with respect to both axes, it is necessary to plot only one quarter of the ellipse. The distance between the points $C$ and $O$, and the lengths of the major and minor axes represent on the enlarged scale the corresponding measurements in Figure 2.

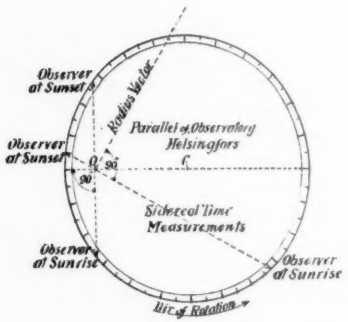



Figure 3.

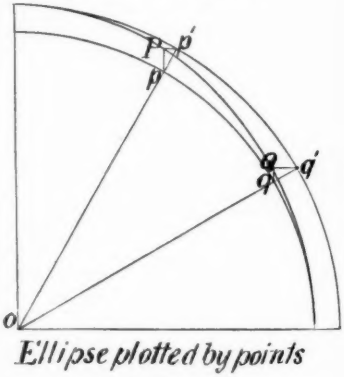
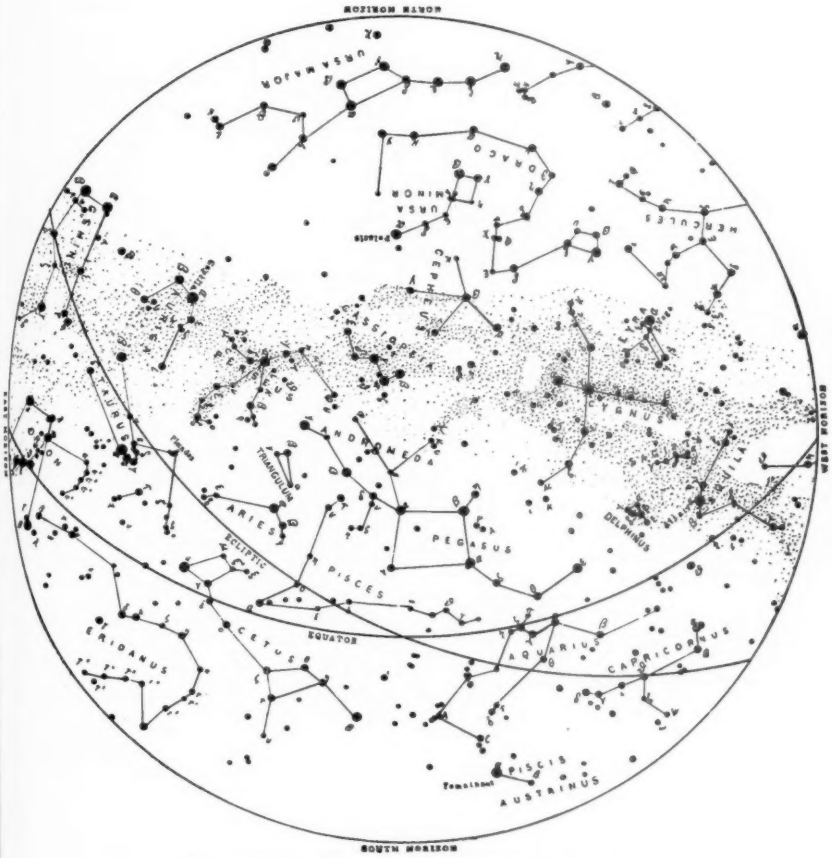



Figure 4.

The position of the radius vector for any day of the year is given in the *Nautical Almanac;* and the chord drawn through $O$ perpendicular to the radius vector intersects the ellipse which, if the earth were sta-

tionary, would give the interval of time between sunset and sunrise; and between sunrise and sunset. But, since the earth moves in its orbit on the average nearly one degree a day, the sum of the lengths of the day and night is increased by nearly four minutes, the difference between a sidereal and a meantime day.

Trinity College, Hartford, Connecticut.




THE CONSTELLATIONS AT 9:00 P. M. NOVEMBER 1.

## PLANET NOTES FOR NOVEMBER.

By CLIFFORD E. SMITH.

The *Sun* during November will move southeastward across Libra, the upper part of Scorpio, and into the small extension of Ophiuchus near $\psi$ Ophiuchi. Its

position at the end of the month will be $16^h\ 20^m\ 47^s$ in R. A. and $-21°\ 29'\ 26''$ in Dec., so that it will be about 4½° north of Antares.

The phases of the *Moon* for November are:

| | | |
|---|---|---|
| New Moon | Nov. 5 at 9 A.M. | C.S.T. |
| First Quarter | 12 " 5 P.M. | " |
| Full Moon | 19 " 10 A.M. | " |
| Last Quarter | 27 " 1 A.M. | " |

The moon will be at perigee November 16 and at apogee November 28.

*Mercury* will be in its most favorable position for evening observation about the fifth of the month when it will be at greatest elongation east. At this time it will set about 1½ hours after the sun. Other phenomena of note in regard to Mercury are that on November 26 it will be at inferior conjunction, and on November 28 it will pass through perihelion.

*Venus* is close to the sun on the west and is approaching superior conjunction which will occur on November 21. Consequently it will be invisible during this month.

*Mars* throughout the month will be moving westward in Aries about one-third the way from Alpheratz to Sirius. During this month Mars will be in rather a favorable position for observation in northern latitudes since its declination is 14° north. It will be in opposition on November 4, at which time it will cross the meridian at midnight.

*Jupiter* at this time will be in a position for early evening observation only, since it will be in quadrature, 90° east of the sun, on November 11. Jupiter is moving northeast in Capricornus some 16° south of the equator.

*Saturn* will be too near the sun for observation, setting about 1¼ hours after the sun at the beginning of the month. Conjunction with the sun will occur on November 21.

*Uranus* is in Pisces about three hours east of Jupiter and is near the equator. It will be in a favorable position for evening observation.

*Neptune* is in Leo about ten minutes of time west of Regulus and will be in quadrature, 90° west of the sun, on November 20. It can be observed only during the morning hours.

## Occultations Visible at Washington.

[From the *American Ephemeris.*]

| Date 1926 | | Star's Name | Magnitude | IMMERSION. Washington C.T. | IMMERSION. Angle from N | EMERSION. Washington C.T. | EMERSION. Angle from N | Duration |
|---|---|---|---|---|---|---|---|---|
| | | | | h m | ° | h m | ° | h m |
| Nov. 9 | 26 | Sagittarii | 6.1 | 17 56 | 70 | 19 7 | 278 | 1 12 |
| 10 | 53 | Sagittarii | 6.3 | 17 8 | 62 | 18 26 | 277 | 1 18 |
| 10 | 274 | B. Sagittarii | 6.1 | 17 18 | 65 | 18 36 | 273 | 1 18 |
| 13 | 56 | Aquarii | 6.1 | 15 14 | 8 | 15 45 | 316 | 0 31 |
| 14 | 336 | B. Aquarii | 6.3 | 17 15 | 9 | 17 57 | 298 | 0 43 |
| 16 | 117 | G. Piscium | 6.5 | 23 35 | 11 | 0 24 | 286 | 0 49 |
| 18 | 389 | B. Ceti | 6.3 | 3 43 | 107 | 4 30 | 215 | 0 47 |
| 19 | 180 | B. Tauri | 6.1 | 19 32 | 47 | 20 30 | 266 | 0 58 |
| 20 | | *l* Tauri | 5.2 | 20 27 | 86 | 21 29 | 235 | 1 2 |
| 21 | 14 | B.Geminorum | 6.0 | 22 36 | 148 | 22 59 | 185 | 0 23 |
| 22 | | $\eta$ Geminorum | 3.2 | 1 32 | 121 | 2 41 | 226 | 1 9 |
| 22 | | $\mu$ Geminorum | 3.2 | 6 20 | 122 | 7 18 | 247 | 0 58 |
| 22 | 44 | Geminorum | 5.9 | 21 41 | 105 | 22 40 | 240 | 0 59 |
| 24 | | $\mu$ Cancri | 5.5 | 2 14 | 177 | 2 27 | 194 | 0 13 |

## VARIABLE STARS.

### Minima of Variable Stars of Short Period.

[Calculated by members of the classes in Astronomy at Carleton College.]

Given to the nearest hour in Greenwich civil time; to obtain Eastern Standard time subtract $5^h$; Central Standard time $6^h$. etc.

| Star | R.A. 1900 | Decl. 1900 | Magnitude | Approx. Period | Greenwich civil times of minima in 1926 November | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | h m | ° ′ | . | d h | d h | d h | d h | d h | d h | d h | d h | d h |
| SY Androm. | 0 08.0 | +43 09 | 9.5—13.0 | 34 21.8 | | | | | | | 28 | 12 |
| RT Sculptor. | 31.5 | —26 13 | 9.6—10.5 | 0 12.3 | 5 6 | | 12 22 | | 20 14 | | 28 | 6 |
| U Cephei | 0 53.4 | +81 20 | 7.0— 9.0 | 2 11.8 | 7 12 | | 15 0 | | 22 11 | | 29 | 23 |
| Z Persei | 2 33.7 | +41 46 | 9.4—12 | 3 01.4 | 4 22 | | 11 1 | | 23 6 | | 29 | 9 |
| TW Cassiop. | 37.6 | +65 19 | 8.2— 9.0 | 1 10.3 | 4 18 | | 13 7 | | 21 21 | | 30 | 11 |
| RY Persei | 39.0 | +47 43 | 8.0—10.3 | 6 20.7 | 4 18 | | 11 14 | | 18 11 | | 25 | 8 |
| RZ Cassiop. | 39.9 | +69 13 | 6.9— 8.1 | 1 04.7 | 5 1 | | 12 5 | | 19 10 | | 26 | 14 |
| TX Cassiop. | 44.4 | +62 22 | 9.4—10.1 | 2 22.2 | 5 3 | | 13 22 | | 22 17 | | | |
| ST Persei | 53.7 | +38 47 | 8.5—10.5 | 2 15.6 | 8 7 | | 16 6 | | 24 5 | | | |
| RX Cassiop. | 2 58.8 | +67 11 | 8.6— 9.1 | 32 07.6 | | | | | | | 27 | 5 |
| Algol | 3 01.7 | +40 34 | 2.3— 3.5 | 2 20.8 | 8 3 | | 16 17 | | 25 7 | | | |
| RT Persei | 16.7 | +46 12 | 9.5—11.5 | 0 20.4 | 7 9 | | 14 4 | | 20 23 | | 27 | 18 |
| λ Tauri | 55.1 | +12 12 | 3.3— 4.2 | 3 22.9 | 7 20 | | 15 18 | | 23 15 | | | |
| RW Tauri | 3 57.8 | +27 51 | 7.1— [11 | 2 18.5 | 7 6 | | 15 13 | | 23 20 | | | |
| RV Persei | 4 04.2 | +33 59 | 9.5—11.0 | 1 23.4 | 6 19 | | 14 17 | | 22 14 | | 30 | 12 |
| RW Persei | 13.3 | +42 04 | 8.8—11.0 | 13 04.8 | 3 0 | | 16 5 | | 29 10 | | | |
| SZ Tauri | 31.4 | +18 20 | 7.2— 7.7 | 3 03.6 | 3 2 | | 9 9 | | 21 23 | | 28 | 6 |
| RS Cephei | 4 48.6 | +80 06 | 9.5—12.0 | 12 10.1 | 9 5 | | | | 21 15 | | | |
| TT Aurigae | 5 02.8 | +39 27 | 7.8— 8.7 | 0 16.0 | 6 10 | | 13 1 | | 19 17 | | 26 | 9 |
| RY Aurigae | 11.5 | +38 13 | 10.7—11.7 | 2 17.5 | 1 5 | | 9 10 | | 17 14 | | 25 | 18 |
| RZ Aurigae | 42.9 | +31 40 | 10.6—13.3 | 3 00.3 | 3 18 | | 9 18 | | 21 19 | | 27 | 20 |
| SV Tauri | 45.8 | +28 05 | 9.4—11.0 | 2 04.0 | 9 4 | | 17 20 | | 26 12 | | | |
| Z Orionis | 50.2 | +13 40 | 9.7—10.7 | 5 04.9 | 6 19 | | 17 5 | | 27 15 | | | |
| SV Gemin. | 54.6 | +24 28 | 9.8— [11 | 4 00.2 | 4 6 | | 12 6 | | 20 7 | | 28 | 7 |
| RW Gemin. | 5 55.4 | +23 08 | 9.5—11.0 | 2 20.8 | 5 1 | | 10 19 | | 22 6 | | 28 | 0 |
| U Columbæ | 6 11.2 | —33 03 | 9.2—10.0 | 2 19.2 | 4 7 | | 9 22 | | 21 3 | | 26 | 17 |
| SX Gemin. | 22.0 | +20 37 | 10.8—11.5 | 1 08.8 | 7 12 | | 15 17 | | 23 22 | | | |
| RW Monoc. | 29.3 | + 8 54 | 9.0—10.8 | 1 21.7 | 5 5 | | 12 20 | | 20 11 | | 28 | 2 |
| RX Gemin. | 43 6 | +33 21 | 8.8— 9.6 | 12 05.0 | | | 11 19 | | | | 23 | 23 |
| RU Monoc. | 6 49.4 | — 7 28 | 9.8—10.5 | 0 21.5 | 2 1 | | 8 4 | | 22 12 | | 29 | 16 |
| R Can. Maj. | 7 14.9 | —16 12 | 5.8— 6.4 | 1 03.3 | 3 7 | | 10 3 | | 23 18 | | 30 | 13 |
| RY Gemin. | 21.7 | +15 52 | 8.9— [10 | 9 07.2 | 3 9 | | 13 2 | | 22 10 | | | |
| Y Camelop. | 27.6 | +76 17 | 9.5—12 | 3 07.3 | 2 2 | | 8 17 | | 21 23 | | 28 | 13 |
| TX Gemin. | 30.3 | +17 08 | 10.0—11.9 | 2 19.2 | 1 2 | | 10 6 | | 18 15 | | 27 | 1 |
| RR Puppis | 43.5 | —41 08 | 9.4—10.7 | 6 10.3 | 1 11 | | 7 21 | | 20 17 | | 27 | 4 |
| V Puppis | 7 55.4 | —48 58 | 4.1— 4.8 | 1 10.9 | 4 21 | | 12 4 | | 19 10 | | 26 | 17 |
| X Carinæ | 8 29.1 | —58 53 | 7.9— 8.7 | 0 13.0 | 2 4 | | 10 7 | | 18 10 | | 26 | 13 |
| S Cancri | 8 38.2 | +19 24 | 8.2—10 | 9 11.6 | 6 9 | | 15 21 | | 25 9 | | | |
| RX Hydræ | 9 00.8 | — 7 52 | 9.1—10.5 | 2 06.8 | 3 18 | | 10 15 | | 17 11 | | 24 | 7 |
| S Velorum | 29.4 | —44 46 | 7.8— 9.3 | 5 22.4 | 3 22 | | 9 21 | | 21 17 | | 27 | 16 |
| Y Leonis | 9 31.1 | +26 41 | 9.3—11.2 | 1 16.5 | 6 7 | | 13 1 | | 19 19 | | 26 | 12 |
| RR Velorum | 10 17.8 | —41 36 | 10.0—10.9 | 1 20.5 | 3 10 | | 10 20 | | 18 6 | | 25 | 16 |
| SS Carinæ | 10 54.2 | —61 23 | 12.2—12.8 | 3 07.2 | 2 12 | | 9 2 | | 22 7 | | 28 | 21 |
| ST Urs. Maj. | 11 22.4 | +45 44 | 6.7— 7.2 | 8 19.2 | 9 12 | | 18 7 | | 27 3 | | | |
| RW Urs. Maj. | 35.4 | +52 34 | 10.3—11.4 | 7 07.9 | 1 8 | | 8 15 | | 23 7 | | 30 | 15 |
| Z Draconis | 11 39.8 | +72 49 | 9.9—13.6 | 1 08.6 | 3 7 | | 10 2 | | 23 16 | | 30 | 11 |
| RZ Centauri | 12 55.6 | —64 05 | 8.5— 8.9 | 1 21.0 | 4 4 | | 11 16 | | 19 4 | | 26 | 16 |
| RS Can. Ven. | 13 06.3 | +36 28 | 7.5—12.5 | 4 19.1 | 7 8 | | 16 23 | | 26 13 | | | |
| SS Centauri | 07.2 | —63 37 | 8.8—10.4 | 2 11.5 | 6 0 | | 13 11 | | 20 21 | | 28 | 8 |
| SX Hydræ | 13 39.0 | —26 23 | 8.6—12.7 | 2 21.5 | 1 22 | | 13 12 | | 19 7 | | 30 | 21 |
| δ Libræ | 14 55.6 | — 8 07 | 4.8— 6.2 | 2 07.9 | 1 18 | | 8 18 | | 22 17 | | 29 | 17 |
| U Coronæ | 15 14.1 | +32 01 | 7.6— 8.7 | 3 10.9 | 6 16 | | 13 13 | | 20 11 | | 27 | 9 |

**Minima of Variable Stars of Short Period—Continued.**

| Star | R.A. 1900 | Decl. 1900 | Magnitude | Approx. Period | Greenwich civil times of minima in 1926 November | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | h m | ° ′ | | d h | d h | d h | d h | d h | d h | d h | d h | d h |
| TW Draconis | 15 32.4 | +64 14 | 7.3— 8.9 | 2 19.4 | 8 17 | 17 3 | 25 13 | | | | | |
| SS Libræ | 15 43.4 | —15 14 | 9.3—11.5 | 0 18.4 | 4 13 | 11 17 | 18 22 | 26 3 | | | | |
| SW Ophiuchi | 16 11.1 | — 6 44 | 9.2—10.0 | 2 10.7 | 6 16 | 14 0 | 21 8 | 28 17 | | | | |
| SX Ophiuchi | 12.6 | — 6 25 | 10.5—11.2 | 2 01.5 | 4 23 | 13 5 | 21 11 | 29 17 | | | | |
| R Aræ | 31.1 | —56 48 | 6.8— 7.9 | 4 10.2 | 2 23 | 11 20 | 20 16 | 29 12 | | | | |
| TT Herculis | 16 49.9 | +17 00 | 8.9— 9.3 | 20 18.1 | | 16 18 | | | | | | |
| TU Herculis | 17 09.8 | +30 50 | 9.5—12 | 2 06.4 | 1 17 | 8 12 | 22 2 | 28 21 | | | | |
| U Ophiuchi | 11.5 | + 1 19 | 6.0— 6.7 | 1 16.2 | 2 3 | 10 13 | 18 22 | 27 7 | | | | |
| *u* Herculis | 13.6 | +33 12 | 4.6— 5.4 | 2 01.2 | 5 1 | 11 5 | 23 12 | 29 16 | | | | |
| TX Herculis | 15.4 | +42 00 | 8.3— 9.0 | 2 01.4 | 3 21 | 10 1 | 22 10 | 28 14 | | | | |
| RV Ophiuchi | 29.8 | + 7 19 | 9. —12 | 3 16.5 | 3 19 | 11 4 | 18 13 | 25 22 | | | | |
| SZ Herculis | 36.0 | +33 01 | 9.5—10.3 | 0 19.6 | 8 20 | 17 0 | 25 4 | | | | | |
| TX Scorpii | 48.6 | —34 13 | 7.5— 8.2 | 0 22.6 | 8 3 | 15 16 | 23 5 | 30 18 | | | | |
| UX Herculis | 49.7 | +16 57 | 8.8—10.5 | 1 13.2 | 3 23 | 11 18 | 19 12 | 27 6 | | | | |
| Z Herculis | 53.6 | +15 09 | 7.1— 7.9 | 3 23.8 | 1 16 | 9 15 | 17 15 | 25 15 | | | | |
| WX Sagittarii | 53.6 | —17 24 | 9.2—10.8 | 2 03.1 | 7 20 | 16 9 | 24 21 | | | | | |
| WY Sagittarii | 17 54.9 | —23 01 | 9.5—10.6 | 4 16.0 | 5 7 | 14 16 | 19 8 | 28 16 | | | | |
| SX Draconis | 18 03.0 | +58 23 | 9.3—10.5 | 5 04.1 | 5 1 | 15 9 | 20 13 | 30 21 | | | | |
| RS Sagittarii | 11.0 | —34 08 | 5.9— 6.3 | 2 10.0 | 6 12 | 13 18 | 21 1 | 28 6 | | | | |
| V Serpentis | 11.1 | —15 34 | 9.5—11.1 | 3 10.9 | 5 12 | 12 10 | 19 8 | 26 6 | | | | |
| RZ Scuti | 21.1 | — 9 15 | 7.4— 8.3 | 15 03.2 | | 10 4 | | 25 7 | | | | |
| RZ Draconis | 21.8 | +58 50 | 9.5—10.2 | 0 13.2 | 4 4 | 11 8 | 18 12 | 25 16 | | | | |
| RX Herculis | 26.0 | +12 32 | 7.0— 7.6 | 0 21.3 | 4 1 | 11 4 | 18 7 | 25 10 | | | | |
| SX Sagittarii | 39.7 | —30 36 | 8.7— 9.8 | 2 01.8 | 7 16 | 15 23 | 24 7 | | | | | |
| RR Draconis | 40.8 | +62 34 | 9.3—13 | 2 19.9 | 4 1 | 12 13 | 21 0 | 29 12 | | | | |
| RS Scuti | 43.7 | —10 21 | 9.3—10.3 | 0 15.9 | 5 14 | 12 6 | 18 21 | 25 13 | | | | |
| *β* Lyræ | 46.4 | +33 15 | 3.4— 4.1 | 12 21.8 | | 13 2 | | 26 0 | | | | |
| U Scuti | 18 48.9 | —12 44 | 9.1— 9.6 | 0 22.9 | 1 19 | 9 11 | 17 2 | 24 18 | | | | |
| RX Draconis | 19 01.1 | +58 35 | 9.3—10.2 | 1 21.4 | 1 22 | 9 12 | 17 2 | 24 16 | | | | |
| RV Lyræ | 12.5 | +32 15 | 11. —12.8 | 3 14.4 | 1 21 | 9 2 | 23 12 | 30 16 | | | | |
| RS Vulpec. | 13.4 | +22 16 | 6.9— 8.0 | 4 11.4 | 5 2 | 14 1 | 23 0 | | | | | |
| U Sagittæ | 14.4 | +19 26 | 6.5— 9.0 | 3 09.1 | 1 19 | 8 13 | 22 2 | 28 20 | | | | |
| Z Vulpec. | 17.5 | +25 23 | 7.3— 8.5 | 2 10.9 | 3 6 | 10 14 | 17 23 | 25 8 | | | | |
| TT Lyræ | 24.3 | +41 30 | 9.4—11.6 | 5 05.8 | 5 5 | 10 11 | 20 23 | 26 5 | | | | |
| UZ Draconis | 26.1 | +68 44 | 9.0— 9.8 | 1 15.1 | 5 10 | 10 23 | 18 11 | 25 0 | | | | |
| SY Cygni | 19 42.7 | +32 28 | 10. —12 | 6 00.2 | 4 14 | 10 14 | 22 14 | 28 14 | | | | |
| WW Cygni | 20 00.6 | +41 18 | 9.3—13.4 | 3 07.6 | 1 13 | 8 5 | 21 11 | 28 2 | | | | |
| SW Cygni | 03.8 | +46 01 | 9. —11.7 | 4 13.8 | 4 22 | 14 1 | 18 15 | 27 19 | | | | |
| VW Cygni | 11.4 | +34 12 | 9.8—11.8 | 8 10.3 | 1 14 | 10 3 | 18 11 | 26 22 | | | | |
| RW Capric. | 12.2 | —17 59 | 8.8—10.6 | 3 09.4 | 7 4 | 13 23 | 20 18 | 27 12 | | | | |
| UW Cygni | 19.6 | +42 55 | 10.5—13 | 3 10.8 | 5 7 | 12 5 | 19 3 | 26 0 | | | | |
| V Vulpec. | 32.3 | +26 15 | 8.2— 9.8 | 37 19.0 | | 19 2 | | | | | | |
| W Delphini | 33.1 | +17 56 | 9.4—12.1 | 4 19.4 | 5 17 | 15 7 | 20 3 | 29 17 | | | | |
| RR Delphini | 38.9 | +13 35 | 10.5—11.8 | 4 14.4 | 1 1 | 10 5 | 19 10 | 28 15 | | | | |
| Y Cygni | 48.1 | +34 17 | 7.1— 7.9 | 2 23.9 | 5 1 | 14 0 | 23 0 | | | | | |
| WZ Cygni | 49.3 | +38 27 | 9.9—10.8 | 0 14.0 | 5 14 | 13 5 | 20 19 | 28 10 | | | | |
| RR Vulpec. | 20 50.5 | +27 32 | 9.6—11.0 | 5 01.2 | 9 8 | 19 10 | 29 12 | | | | | |
| RY Aquarii | 21 14.8 | —11 14 | 8.8—10.4 | 1 23.2 | 3 22 | 11 18 | 19 15 | 27 12 | | | | |
| UZ Cygni | 55.2 | +43 52 | 8.9—11.6 | 31 07.3 | 2 17 | | | | | | | |
| RT Lacertæ | 21 57.4 | +43 24 | 9.1—10.5 | 5 01.7 | 2 5 | 7 7 | 17 10 | 22 12 | | | | |
| RW Lacertæ | 22 40.6 | +49 08 | 10.2—11.2 | 5 04.4 | 2 17 | 13 2 | 18 7 | 28 16 | | | | |
| VW Pegasi | 51.7 | +32 42 | 10.0—10.6 | 5 06.4 | 2 9 | 12 22 | 18 5 | 28 17 | | | | |
| Y Piscium | 23 29.3 | + 7 22 | 9.0—12.0 | 3 18.4 | 1 20 | 9 9 | 16 22 | 24 11 | | | | |
| TW Androm. | 23 58.2 | +32 17 | 8.6—11.5 | 4 02.9 | 6 6 | 14 12 | 22 18 | 31 0 | | | | |

## Maxima of Variable Stars of Short Period.

[Calculated by members of the classes in Astronomy at Carleton College.]

Given to the nearest hour in Greenwich civil time; to obtain Eastern Standard time subtract $5^h$; Central Standard time $6^h$, etc.

| Star | R.A. 1900 | Decl. 1900 | Magnitude | Approx. Period | Greenwich civil times of maxima in 1926 November | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | h m | ° ′ | | d h | d h | d h | d h | d h | d h | d h |
| SX Cassiop. | 0 05.5 | +54 20 | 8.6— 9.2 | 36 13.7 | 4 6 | | | | | |
| SY Cassiop. | 0 09.8 | +57 52 | 9.3— 9.9 | 4 01.7 | 4 15 | 12 19 | 20 22 | 29 2 | | |
| RR Ceti | 1 27.0 | + 0 50 | 8.3— 9.0 | 0 13.3 | 5 2 | 12 20 | 20 14 | 28 8 | | |
| RW Cassiop. | 1 30.7 | +57 15 | 8.9—11.0 | 14 19.2 | | 13 1 | 27 19 | | | |
| V Arietis | 2 09.6 | +11 46 | 8.3— 9.0 | 0 23.8 | 3 23 | 11 21 | 19 20 | 27 18 | | |
| SU Cassiop. | 2 43.0 | +68 28 | 6.5— 7.0 | 1 22.8 | 8 6 | 16 2 | 23 21 | | | |
| RW Camelop. | 3 46.2 | +58 21 | 8.2— 9.4 | 16 00.0 | 8 18 | | 25 4 | | | |
| SX Persei | 4 10.2 | +41 27 | 10.4—11.2 | 4 07.0 | 1 15 | 10 5 | 18 18 | 27 8 | | |
| SV Persei | 42.8 | +42 07 | 8.8— 9.6 | 11 03.1 | | 11 4 | 22 7 | | | |
| RX Aurigæ | 4 54.5 | +39 49 | 7.2— 8.1 | 11 15.0 | 6 18 | 18 9 | 30 1 | | | |
| SX Aurigæ | 5 04.6 | +42 02 | 8.0— 8.7 | 1 12.8 | 3 21 | 11 13 | 19 5 | 26 21 | | |
| SY Aurigæ | 05.5 | +42 41 | 8.4— 9.5 | 10 03.3 | 8 15 | 18 18 | 28 21 | | | |
| Y Aurigæ | 21.5 | +42 21 | 8.6— 9.6 | 3 20.6 | 2 14 | 10 7 | 18 1 | 25 18 | | |
| RZ Gemin. | 5 56.6 | +22 15 | 9.1—10.0 | 5 12.7 | 1 23 | 13 1 | 18 13 | 29 14 | | |
| RS Orionis | 6 16.5 | +14 44 | 8.2— 8.9 | 7 13.6 | 7 18 | 15 7 | 22 21 | 30 11 | | |
| T Monoc. | 19.8 | + 7 08 | 5.7— 6.8 | 27 00.3 | | | 21 9 | | | |
| RT Aurigæ | 23.0 | +30 33 | 5.1— 6.0 | 3 17.5 | 3 23 | 11 9 | 18 20 | 26 7 | | |
| W Gemin. | 29.2 | +15 24 | 6.7— 7.5 | 7 22.0 | 4 6 | 12 4 | 20 2 | 28 0 | | |
| ζ Gemin. | 6 58.2 | +20 43 | 3.7— 4.3 | 10 03.7 | 3 19 | 13 23 | 24 2 | | | |
| RU Camelop. | 7 10.9 | +69 51 | 8.5— 9.8 | 22 06.5 | | 16 0 | | | | |
| RR Gemin. | 7 15.2 | +31 04 | 10.0—11.5 | 0 09.5 | 5 4 | 13 3 | 21 2 | 29 0 | | |
| V Carinæ | 8 26.7 | —59 47 | 7.4— 8.1 | 6 16.7 | 8 22 | 15 15 | 22 7 | 29 0 | | |
| T Velorum | 8 34.4 | —47 01 | 7.6— 8.5 | 4 15.3 | 1 7 | 10 13 | 19 20 | 29 3 | | |
| V Velorum | 9 19.2 | —55 32 | 7.5— 8.2 | 4 08.9 | 1 17 | 10 11 | 19 4 | 27 22 | | |
| Z Leonis | 9 46.4 | +27 22 | 7.9— 9.6 | 56 08.7 | 3 17 | | | | | |
| RR Leonis | 10 02.1 | +24 29 | 9.1—10.1 | 0 10.9 | 7 5 | 14 0 | 20 19 | 27 14 | | |
| SU Draconis | 11 32.2 | +67 53 | 8.9— 9.6 | 0 15.8 | 7 3 | 13 18 | 20 8 | 26 23 | | |
| S Muscæ | 12 07.4 | —69 36 | 6.4— 7.3 | 9 15.8 | 1 21 | 11 13 | 21 5 | 30 20 | | |
| SW Draconis | 12.8 | +70 04 | 8.8— 9.6 | 0 13.7 | 6 3 | 14 3 | 22 2 | 31 2 | | |
| T Crucis | 15.9 | —61 44 | 6.8— 7.6 | 6 17.6 | 4 4 | 10 22 | 17 16 | **24 10** | | |
| R Crucis | 18.1 | —61 04 | 6.8— 7.9 | 5 19.8 | 5 7 | 11 3 | 22 19 | 28 15 | | |
| S Crucis | 12 48.4 | —57 53 | 6.5— 7.6 | 4 16.6 | 4 15 | 13 23 | 18 16 | 28 1 | | |
| W Virginis | 13 20.9 | — 2 52 | 8.7—10.4 | 17 06.5 | | 13 1 | | | | |
| SS Hydræ | 25.0 | —23 08 | 7.4— 8.1 | 8 04.8 | 4 22 | 12 3 | 20 7 | 27 12 | | |
| RV Urs. Maj. | 13 29.4 | +54 31 | 9.2— 9.9 | 0 11.2 | 6 15 | 13 16 | 20 16 | 27 17 | | |
| ST Virginis | 14 22.5 | — 0 27 | 10.3—11.4 | 0 09.9 | 6 18 | 14 4 | 21 13 | 28 23 | | |
| V Centauri | 25.4 | —56 27 | 6.4— 7.8 | 5 11.9 | 1 17 | 12 17 | 18 5 | 29 5 | | |
| RS Bootis | 29.3 | +32 11 | 8.9—10.0 | 0 09.1 | 5 2 | 12 16 | 20 5 | 27 18 | | |
| R Trian.Austr. | 15 10.8 | —66 08 | 6.7— 7.4 | 3 09.3 | 3 23 | 10 18 | 17 12 | **24 7** | | |
| S Trian.Austr. | 15 52.2 | —63 29 | 6.4— 7.4 | 6 07.8 | 4 17 | 11 1 | 23 16 | 30 1 | | |
| S Normæ | 16 10.6 | —57 39 | 6.6— 7.6 | 9 18.1 | 1 11 | 11 5 | 20 23 | 30 17 | | |
| RW Draconis | 33.7 | +58 03 | 9.6—10.8 | 0 10.6 | 2 13 | 11 10 | 20 7 | 29 3 | | |
| RV Scorpii | 16 51.8 | —33 27 | 6.7— 7.4 | 6 01.5 | 3 1 | 9 3 | 21 6 | 27 7 | | |
| X Sagittarii | 17 41.3 | —27 48 | 4.4— 5.0 | 7 00.3 | 1 3 | 8 17 | 16 8 | 23 22 | | |
| Y Ophiuchi | 47.3 | — 6 07 | 6.1— 6.5 | 17 02.9 | 2 11 | | 19 14 | | | |
| W Sagittarii | 17 58.6 | —29 35 | 4.3— 5.1 | 7 14.3 | 1 3 | 8 17 | 16 8 | 23 22 | | |
| Y Sagittarii | 18 15.5 | —18 54 | 5.4— 6.2 | 5 18.6 | 2 17 | 8 12 | 20 1 | 25 19 | | |
| U Sagittarii | 26.0 | —19 12 | 6.5— 7.3 | 6 17.9 | 3 12 | 10 6 | 16 23 | 23 17 | | |
| Y Scuti | 32.6 | — 8 27 | 8.7— 9.2 | 10 08.3 | 3 0 | 13 8 | 23 17 | | | |
| RZ Lyræ | 39.9 | +32 42 | 9.9—11.2 | 0 12.3 | 3 19 | 11 11 | 19 3 | 26 19 | | |
| RT Scuti | 18 44.1 | —10 30 | 9.1— 9.7 | 0 11.9 | 2 5 | 9 15 | 17 1 | 24 12 | | |
| κ Pavonis | 18 46.6 | —67 22 | 3.8— 5.2 | 9 02.2 | 1 15 | 10 17 | 19 20 | 28 22 | | |
| U Aquilæ | 19 24.0 | — 7 15 | 6.2— 6.9 | 7 00.6 | 2 15 | 9 15 | 23 16 | 30 17 | | |
| XZ Cygni | 19 30.4 | +56 10 | 8.6— 9.3 | 0 11.2 | 8 4 | 15 4 | 22 4 | 29 4 | | |

**Maxima of Variable Stars of Short Period—Continued.**

| Star | R.A. 1900 | Decl. 1900 | Magnitude | Approx. Period | Greenwich civil times of maxima in 1926 November | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | h m | ° ′ | | d h | d h | d h | d h | d h | d h | |
| U Vulpec. | 32.2 | +20 07 | 6.5— 7.6 | 7 23.5 | 2 4 | 10 3 | 18 3 | 26 3 | | |
| SU Cygni | 40.8 | +29 01 | 6.2— 7.0 | 3 20.3 | 4 22 | 12 14 | 20 7 | 28 0 | | |
| η Aquilæ | 47.4 | + 0 45 | 3.7— 4.5 | 7 04.2 | 4 10 | 11 14 | 18 18 | 25 23 | | |
| S Sagittæ | 51.5 | +16 22 | 5.6— 6.4 | 8 09.2 | 4 23 | 13 9 | 21 18 | 30 3 | | |
| X Vulpec. | 19 53.3 | +26 17 | 9.5—10.5 | 6 07.7 | 6 5 | 12 12 | 18 20 | 25 3 | | |
| X Cygni | 20 39.5 | +35 14 | 6.0— 7.0 | 16 09.3 | 3 19 | | 19 18 | | | |
| T Vulpec. | 47.2 | +27 52 | 5.5— 6.1 | 4 10.5 | 3 21 | 12 18 | 21 15 | 30 12 | | |
| UY Cygni | 52.3 | +30 03 | 9.6—10.4 | 0 13.5 | 6 6 | 13 13 | 20 20 | 28 3 | | |
| RV Capric. | 55.9 | —15 37 | 9.2—10.1 | 0 10.7 | 6 8 | 13 12 | 20 16 | 27 20 | | |
| TX Cygni | 20 56.4 | +42 12 | 8.5— 9.7 | 14 17.4 | 2 1 | | 16 17 | | | |
| VY Cygni | 21 00.4 | +39 34 | 8.8— 9.5 | 7 20.6 | 8 1 | 15 21 | 23 18 | | | |
| SW Aquarii | 10.2 | — 0 20 | 9.9—10.8 | 0 11.0 | 1 19 | 8 16 | 22 11 | 29 8 | | |
| VZ Cygni | 21 47.7 | +42 40 | 8.2— 9.2 | 4 20.7 | 5 4 | 14 22 | 19 18 | 29 12 | | |
| Y Lacertæ | 22 05.2 | +50 33 | 9.1— 9.6 | 4 07.8 | 2 9 | 11 1 | 19 16 | 28 8 | | |
| δ Cephei | 25.5 | +57 54 | 3.7— 4.6 | 5 08.8 | 2 23 | 13 17 | 19 1 | 29 19 | | |
| Z Lacertæ | 36.9 | +56 18 | 8.2— 9.0 | 10 21.1 | 5 9 | 16 7 | 27 4 | | | |
| RR Lacertæ | 37.5 | +55 55 | 8.5— 9.2 | 6 10.1 | 1 21 | 7 7 | 20 3 | 26 13 | | |
| V Lacertæ | 44.5 | +55 48 | 8.5— 9.5 | 4 23.6 | 5 0 | 14 23 | 19 23 | 29 22 | | |
| X Lacertæ | 22 45.0 | +55 54 | 8.2— 8.6 | 5 10.7 | 5 6 | 10 17 | 21 14 | 27 1 | | |
| SW Cassiop. | 23 03.7 | +58 11 | 9.2— 9.7 | 5 10.6 | 1 21 | 12 18 | 18 4 | 29 1 | | |
| RS Cassiop. | 32.6 | +61 52 | 9.0—11.0 | 6 07.1 | 6 10 | 12 17 | 19 0 | 25 7 | | |
| RY Cassiop. | 47.2 | +58 11 | 9.3—11.8 | 12 03.4 | | 10 15 | 22 18 | | | |
| V Cephei | 23 51.7 | +82 38 | 6.0— 7.0 | 0 23.9 | 7 9 | 14 9 | 21 8 | 28 8 | | |

## Monthly Report of the American Association of Variable Star Observers, for the Month ending July 31, 1926.

The present report, instead of containing those observations received during the months of July and August, 1926, contains those made up to the end of July, 1926. This change has been made in order to facilitate the grouping of the more distant results with those of the nearby observers. This will mean the holding up of the observations made by many of the American observers during August until the following report, but with little evident inconvenience.

We welcome the observations of a new member, Mr. R. E. Glaze, of Oakland, California, trusting that his small beginning may lead to even greater results. Our Russian co-workers also contribute to the present report.

Mr. D. B. Pickering has returned home somewhat earlier than originally planned, and plans to attend our Annual meeting, at which time he will give us the details of his trip abroad, including his intimate meetings with our European members. This meeting will be held at Harvard on October 23, and it promises to be the biggest meeting held in years. Rev. T. C. H. Bouton, of St. Petersburg, Florida, made his annual summer visit to New England during July. President Yalden, Secretary Olcott, and Recording Secretary Campbell were the guests of Vice-President Godfrey at the latter's camp in Norway, Maine, during August. Plans for the coming meeting, as well as for the coming year, were unofficially discussed by this representative body of Council Members.

On the occasion of Associate Editor Fath's visit recently, plans for the future publication of our observations were discussed with the Recording Secretary, the results of which conference will be laid before the Association at the coming annual meeting.

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926

May 0 = J. D. 2424636; June 0 = J. D. 2424667; July 0 = J. D. 2424697.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| 001046 X ANDROMEDAE— | | | | | | |
| | 4681.8 | 12.5 | Wf | 4702.8 | 10.6 | Wf |
| | 4695.8 | 11.4 | Wf | 4705.8 | 10.3 | Wf |
| *001620* T CETI— | | | | | | |
| | 4712.6 | 5.7 | L | | | |
| 001726 T ANDROMEDAE— | | | | | | |
| | 4610.2 | 8.7 | Ch | 4704.8 | 8.3 | Pt |
| 001755 T CASSIOPEIAE— | | | | | | |
| | 4689.5 | 11.5 | L | 4702.5 | 11.6 | L |
| | 4697.8 | 10.8 | Jo | 4704.8 | 11.0 | Pt |
| | 4700.8 | 11.0 | Jo | 4715.5 | 11.8 | L |
| 001838 R ANDROMEDAE— | | | | | | |
| | 4681.8 | 7.2 | Wf | 4704.8 | 7.1 | Wf |
| | 4694.8 | 7.4 | Wf | 4604.8 | 6.8 | Pt |
| | 4696.8 | 6.8 | Cl | 4706.5 | 7.0 | Lp |
| | 4699.8 | 7.0 | Wf | 4710.3 | 6.8 | Ch |
| | 4701.7 | 7.4 | Cm | 4716.7 | 7.3 | Jo |
| | 4701.8 | 6.8 | Jo | | | |
| *001862* S TUCANAE— | | | | | | |
| | 4650.9 | [12.4 | Bl | | | |
| *001909* S CETI— | | | | | | |
| | 4697.5 | 7.5 | L | 4712.6 | 8.0 | L |
| | 4704.8 | 7.9 | Pt | | | |
| 004047 U CASSIOPEIAE— | | | | | | |
| | 4681.8 | 8.6 | Wf | 4704.8 | 8.7 | Pt |
| | 4695.8 | 8.6 | Wf | 4705.8 | 9.0 | Wf |
| | 4702.8 | 9.0 | Wf | | | |
| 004533 RR ANDROMEDAE— | | | | | | |
| | 4681.8 | 9.6 | Wf | 4702.8 | 9.0 | Wf |
| | 4695.8 | 9.2 | Wf | 4705.8 | 8.9 | Wf |
| 004746a RV CASSIOPEIAE— | | | | | | |
| | 4681.8 | 12.6 | Wf | 4704.8 | 10.0 | Wf |
| | 4695.8 | 10.4 | Wf | 4704.8 | 9.5 | Pt |
| | 4702.8 | 9.8 | Wf | | | |
| 004746b — CASSIOPEIAE— | | | | | | |
| | 4695.8 | 10.7 | Wf | 4704.8 | 10.5 | Wf |
| | 4702.8 | 10.6 | Wf | 4704.8 | 10.9 | Pt |
| 004958 W CASSIOPEIAE— | | | | | | |
| | 4681.8 | 9.6 | Wf | 4702.8 | 9.4 | Wf |
| | 4695.8 | 9.3 | Wf | 4704.8 | 8.6 | Pt |
| | 4702.5 | 9.1 | Lp | 4705.8 | 9.2 | Wf |
| *005475* U TUCANAE— | | | | | | |
| | 4640.2 | 10.3 | Sm | 4663.9 | 11.6 | Bl |
| | 4650.9 | 10.6 | Bl | 4672.9 | 12.6 | Bl |
| 005840 RX ANDROMEDAE— | | | | | | |
| | 4704.8 | 10.9 | Pt | 4712.8 | [12.6 | Pt |
| | 4708.7 | 12.6 | Pt | 4726.7 | [11.2 | Pt |
| | 4710.7 | [12.4 | Pt | 4727.6 | 13.0 | Pt |
| | 4710.8 | [12.4 | Pt | | | |
| 010102 Z CETI— | | | | | | |
| | 4704.8 | 11.3 | Pt | | | |
| 010940 U ANDROMEDAE— | | | | | | |
| | 4681.8 | 12.4 | Wf | 4702.8 | 13.1 | Wf |
| | 4695.8 | 13.1 | Wf | 4705.8 | 13.3 | Wf |
| 011041 UZ ANDROMEDAE— | | | | | | |
| | 4681.8 | 14.3 | Wf | 4702.8 | 13.1 | Wf |
| | 4695.8 | 13.1 | Wf | 4705.8 | 12.8 | Wf |
| 011272 S CASSIOPEIAE— | | | | | | |
| | 4695.8 | 13.3 | Wf | 4704.8 | 13.1 | Wf |
| | 4699.8 | 13.2 | Wf | | | |
| 011712 U PISCIUM— | | | | | | |
| | 4704.8 | 11.3 | Pt | | | |
| 012502 R PISCIUM— | | | | | | |
| | 4704.8 | 11.6 | Pt | | | |
| 013238 RU ANDROMEDAE— | | | | | | |
| | 4681.8 | 12.7 | Wf | 4704.8 | 11.6 | Pt |
| | 4695.8 | 12.0 | Wf | 4705.8 | 11.4 | Wf |
| | 4701.8 | 11.9 | Wf | | | |
| 013338 Y ANDROMEDAE— | | | | | | |
| | 4704.8 | 13.2 | Pt | | | |
| 014958 X CASSIOPEIAE— | | | | | | |
| | 4522.4 | 11.1 | Bn | 4621.5 | 11.3 | Bn |
| | 4562.5 | 11.8 | Bn | 4697.5 | 12.8 | Bn |
| | 4584.4 | 11.2 | Bn | 4704.8 | 12.8 | Pt |
| | 4590.5 | 11.1 | Bn | | | |
| 015254 U PERSEI— | | | | | | |
| | 4704.8 | 8.2 | Pt | | | |
| 015912 S ARIETIS— | | | | | | |
| | 4704.8 | 12.0 | Pt | | | |
| 021024 R ARIETIS— | | | | | | |
| | 4694.8 | 9.0 | Wf | 4704.8 | 9.2 | Pt |
| | 4699.8 | 9.1 | Wf | 4709.7 | 9.8 | Gb |
| | 4704.8 | 9.4 | Wf | | | |
| 021143a W ANDROMEDAE— | | | | | | |
| | 4681.8 | 12.6 | Wf | 4704.8 | 12.5 | Pt |
| | 4694.8 | 12.8 | Wf | 4704.9 | 13.0 | Wf |
| | 4699.8 | 12.9 | Wf | | | |
| 021258 T PERSEI— | | | | | | |
| | 4704.8 | 8.5 | Pt | | | |
| 021281 Z CEPHEI— | | | | | | |
| | 4695.7 | 15.4 | Wf | 4705.8 | 15.4 | Wf |
| | 4702.8 | [15.0 | Wf | | | |
| *021403* o CETI— | | | | | | |
| | 4446.3 | 5.3 | Ku | 4528.2 | 4.2 | Ku |
| | 4450.3 | 4.9 | Ku | 4547.1 | 4.7 | Ku |
| | 4469.3 | 4.2 | Ku | 4549.2 | 5.1 | Tc |
| | 4470.2 | 4.1 | Ku | 4552.2 | 5.2 | Ku |
| | 4478.1 | 3.4 | Ku | 4553.1 | 5.3 | Ku |
| | 4486.1 | 3.2 | Ku | 4554.2 | 5.3 | Ku |
| | 4486.3 | 3.3 | Ag | 4555.2 | 5.4 | Ku |
| | 4489.3 | 3.2 | Ag | 4556.2 | 5.4 | Ku |
| | 4502.1 | 3.5 | Ku | 4557.2 | 5.3 | Ku |
| | 4503.2 | 3.6 | Ku | 4559.1 | 5.4 | Ku |
| | 4503.2 | 3.3 | Ag | 4560.2 | 5.2 | Tc |
| | 4506.1 | 3.7 | Ku | 4663.2 | 5.4 | Tc |
| | 4506.2 | 3.5 | Ag | 4664.2 | 5.3 | Tc |
| | 4506.3 | 3.7 | Ku | 4704.8 | 8.3 | Pt |
| | 4510.1 | 3.7 | Ku | 4721.6 | 7.8 | L |
| | 4527.1 | 4.0 | Ku | | | |
| 021558 S PERSEI— | | | | | | |
| | 4702.5 | 9.3 | Lp | 4704.8 | 9.0 | Pt |
| 022150 RR PERSEI— | | | | | | |
| | 4695.8 | 9.9 | Wf | 4705.8 | 10.0 | Wf |
| | 4702.8 | 10.0 | Wf | | | |
| 022980 RR CEPHEI— | | | | | | |
| | 4695.7 | 13.9 | Wf | 4705.8 | 13.6 | Wf |
| | 4702.8 | 13.8 | Wf | | | |
| 023133 R TRIANGULI— | | | | | | |
| | 4704.8 | 7.0 | Pt | | | |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| 024356 W PERSEI— | | | | | | |
| | 4701.7 | 9.8 | Cm | 4706.8 | 9.4 | Cy |
| | 4704.8 | 9.0 | Pt | | | |
| *025050* R HOROLOGII— | | | | | | |
| | 4650.9 | 11.9 | Bl | 4667.9 | [11.5 | Bl |
| *025751* T HOROLOGII— | | | | | | |
| | 4650.9 | 11.8 | Bl | | | |
| *031401* X CETI— | | | | | | |
| | 4721.6 | 9.0 | L | | | |
| 032043 Y PERSEI— | | | | | | |
| | 4704.8 | 8.9 | Pt | 4709.7 | 9.8 | Gb |
| 032335 R PERSEI— | | | | | | |
| | 4694.8 | 12.3 | Wf | 4704.8 | 12.2 | Wf |
| | 4699.8 | 12.4 | Wf | 4704.8 | 12.0 | Pt |
| 043065 T CAMELOPARDALIS— | | | | | | |
| | 4673.4 | 8.7 | L | 4704.8 | 12.0 | Pt |
| | 4683.6 | 8.6 | L | 4702.4 | 8.8 | L |
| | 4694.4 | 8.5 | L | 4714.6 | 8.3 | L |
| *043263* R RETICULI— | | | | | | |
| | 4640.2 | 12.2 | Sm | 4663.9 | 11.0 | Bl |
| | 4640.2 | 12.0 | Ht | 4667.2 | 10 3 | Ht |
| | 4648.2 | 11.4 | Ht | 4668.2 | 10.1 | Sm |
| | 4649.1 | 11.5 | Bl | 4672.9 | 9.9 | Bl |
| | 4649.3 | 11.4 | Sm | 4679.2 | 9.7 | Ht |
| | 4656.2 | 11.2 | Ht | 4681.9 | 8.7 | Bl |
| | 4660.3 | 10.7 | Sm | 4696.9 | 8.1 | Bl |
| | 4663.2 | 10.4 | Ht | | | |
| 043274 X CAMELOPARDALIS— | | | | | | |
| | 4678.7 | 7.9 | Wf | 4704.8 | 8.8 | Pt |
| | 4697.7 | 8.7 | Wf | 4710.7 | 10.4 | Gb |
| | 4704.7 | 9.2 | Wf | | | |
| *043562* R DORADUS— | | | | | | |
| | 4639.2 | 5.8 | En | 4663.2 | 5.6 | Ht |
| | 4640.2 | 5.5 | Sm | 4663.9 | 5.7 | Bl |
| | 4640.2 | 5.5 | Ht | 4668.2 | 5.8 | Sm |
| | 4648.2 | 5.5 | Ht | 4671.2 | 5.5 | Ht |
| | 4649.1 | 5.6 | Bl | 4672.9 | 5.8 | Bl |
| | 4649.3 | 5.5 | Sm | 4679.2 | 5.5 | Ht |
| | 4656.2 | 5.6 | Ht | 4681.9 | 6.0 | Bl |
| | 4660.3 | 5.5 | Sm | 4696.9 | 6.0 | Bl |
| *043738* R CAELI— | | | | | | |
| | 4640.2 | 9.2 | Sm | 4653.2 | 8.8 | Sm |
| | 4640.2 | 9.2 | Ht | 4664.9 | 8.9 | Bl |
| | 4648.2 | 9.0 | Ht | 4672.9 | 8.9 | Bl |
| | 4650.9 | 8.8 | Bl | | | |
| *044349* R PICTORIS— | | | | | | |
| | 4650.9 | 8.0 | Bl | 4672.9 | 8.6 | Bl |
| | 4663.9 | 8.2 | Bl | 4681.9 | 8.6 | Bl |
| *050022* T LEPORIS— | | | | | | |
| | 4650.9 | 11.4 | Bl | | | |
| *050848* S PICTORIS— | | | | | | |
| | 4640.3 | 9.6 | Sm | 4660.3 | 9.3 | Sm |
| | 4642.3 | 9.3 | En | 4663.9 | 8.8 | Bl |
| | 4647.3 | 9.6 | En | 4668.2 | 9.9 | Sm |
| | 4650.9 | 9.4 | Bl | 4668.2 | 9.9 | En |
| | 4651.2 | 9.7 | En | 4672.9 | 9.5 | Bl |
| | 4657.2 | 9.7 | En | 4681.9 | 9.8 | Bl |
| 050953 R AURIGAE— | | | | | | |
| | 4678.7 | 10.2 | Wf | 4704.8 | 9.3 | Pt |
| | 4694.7 | 9.5 | Wf | 4704.9 | 9.8 | Wf |
| | 4700.7 | 9.8 | Wf | | | |
| *051247* T PICTORIS— | | | | | | |
| | 4640.2 | 9.0 | Ht | 4657.2 | 9.3 | En |
| | 4640.3 | 9.2 | Sm | 4663.2 | 10.0 | Ht |
| | 4642.3 | 9.2 | En | 4663.9 | 9.8 | Bl |
| | 4647.3 | 9.4 | En | 4668.2 | 10.1 | Sm |
| | 4648.2 | 9.5 | Ht | 4668.2 | 10.0 | En |
| | 4649.2 | 9.2 | Sm | 4671.2 | 10.6 | Ht |
| | 4650.9 | 9.4 | Bl | 4672.9 | 10.4 | Bl |
| | 4651.2 | 9.0 | En | 4681.9 | 11.2 | Bl |
| | 4656.2 | 9.3 | Ht | | | |
| *051533* T COLUMBAE— | | | | | | |
| | 4640.2 | 10.8 | Sm | 4651.2 | 11.0 | Sm |
| | 4640.2 | 10.7 | Ht | 4656.2 | 11.4 | Ht |
| | 4642.2 | 10.5 | En | 4657.2 | 11.6 | En |
| | 4647.2 | 11.0 | En | 4664.9 | 11.2 | Bl |
| | 4648.2 | 11.0 | Ht | 4668.2 | 11.4 | Sm |
| | 4650.9 | 10.8 | Bl | 4672.9 | 11.5 | Bl |
| | 4651.2 | 11.2 | En | | | |
| 053068 S CAMELOPARDALIS— | | | | | | |
| | 4704.8 | 8.5 | Pt | 4708.7 | 8.6 | Pc |
| *054331* S COLUMBAE— | | | | | | |
| | 4638.2 | 10.8 | Sm | 4651.2 | 11.2 | En |
| | 4640.2 | 10.2 | Ht | 4656.2 | 11.4 | Ht |
| | 4642.2 | 10.8 | En | 4657.2 | 11.2 | En |
| | 4647.2 | 11.1 | En | 4664.9 | 11.3 | Bl |
| | 4648.2 | 11.4 | Ht | 4667.2 | 11.6 | Ht |
| | 4649.2 | 11.2 | Sm | 4668.2 | 11.4 | Sm |
| | 4650.9 | 11.3 | Bl | 4672.9 | 11.5 | Bl |
| *054629* R COLUMBAE— | | | | | | |
| | 4638.2 | 9.0 | Sm | 4660.2 | 9.6 | Sm |
| | 4640.2 | 9.1 | Ht | 4663.2 | 10.2 | Ht |
| | 4642.3 | 9.2 | En | 4664.2 | 10.2 | En |
| | 4647.2 | 9.5 | En | 4664.9 | 10.3 | Bl |
| | 4648.2 | 9.3 | Ht | 4667.2 | 10.2 | Ht |
| | 4649.2 | 9.3 | Sm | 4668.2 | 10.2 | Sm |
| | 4650.9 | 9.6 | Bl | 4669.2 | 10.2 | En |
| | 4651.2 | 9.6 | En | 4671.2 | 10.5 | Ht |
| | 4656.2 | 9.9 | Ht | 4672.9 | 10.5 | Bl |
| | 4657.2 | 10.0 | En | | | |
| 054974 V CAMELOPARDALIS— | | | | | | |
| | 4678.7 | 13.2 | Wf | 4695.8 | 13.8 | Wf |
| | 4694.7 | 13.6 | Wf | 4704.7 | 13.6 | Wf |
| 055353 Z AURIGAE— | | | | | | |
| | 4679.7 | 10.3 | Wf | 4707.8 | 10.0 | Pt |
| | 4697.7 | 9.9 | Wf | 4705.7 | 10.1 | Wf |
| | 4700.7 | 10.1 | Wf | 4712.8 | 10.0 | Pt |
| | 4704.8 | 10.2 | Pt | | | |
| *055686* R OCTANTIS— | | | | | | |
| | 4648.3 | 10.6 | Sm | 4674.9 | 11.1 | Bl |
| | 4649.1 | 10.5 | Bl | 4681.9 | 11.2 | Bl |
| | 4653.2 | 10.7 | Sm | 4696.9 | 11.6 | Bl |
| | 4663.9 | 10.1 | Bl | 4697.3 | 11.6 | Sm |
| | 4669.2 | 11.2 | Sm | | | |
| 060450 X AURIGAE— | | | | | | |
| | 4704.8 | 9.0 | Pt | | | |
| 060547 SS AURIGAE— | | | | | | |
| | 4639.7 | [12.4 | Sg | 4704.8 | [13.3 | Wf |
| | 4678.7 | [12.4 | Wf | 4705.8 | [13.9 | Wf |
| | 4679.7 | [12.4 | Wf | 4706.8 | [13.3 | Wf |
| | 4681.7 | [13.0 | Wf | 4707.8 | [12.4 | Pt |
| | 4694.7 | [12.4 | Wf | 4710.8 | [12.4 | Pt |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| 060547 SS AURIGAE—Continued. | | | | | | |
| | 4695.7 | [12.4 | Wf | 4707.8 | [13.5 | Wf |
| | 4697.7 | [12.4 | Wf | 4712.8 | [12.4 | Pt |
| | 4699.7 | [12.4 | Wf | 4716.8 | [12.4 | Cu |
| | 4700.7 | [12.4 | Wf | 4717.6 | [13.0 | L |
| | 4704.8 | [12.0 | Pt | 4721.6 | [12.4 | L |
| *063462* NOVA PICTORIS, 1925— | | | | | | |
| | 4649.0 | 5.6 | Bl | 4681.9 | 5.6 | Bl |
| | 4663.9 | 5.4 | Bl | 4696.9 | 5.5 | Bl |
| | 4672.9 | 5.5 | El | | | |
| 064030 X GEMINORUM— | | | | | | |
| | 4519.5 | 8.3 | Bn | 4535.3 | 8.7 | Bn |
| | 4527.5 | 8.7 | Bn | 4585.4 | 12.4 | Bn |
| 065355 R LYNCIS— | | | | | | |
| | 4678.7 | 9.6 | Wf | 4700.7 | 8.2 | Wf |
| | 4694.7 | 8 6 | Wf | 4704.9 | 8.1 | Wf |
| *070772* R VOLANTIS— | | | | | | |
| | 4640.3 | 10.9 | Sm | 4657.2 | 11.6 | Bl |
| | 4640.3 | 10.4 | Ht | 4667.2 | 11.3 | Ht |
| | 4642.3 | 11.3 | En | 4668.3 | 11.3 | Sm |
| | 4647.3 | 11.5 | En | 4671.2 | 11.5 | Ht |
| | 4648.4 | 10.8 | Ht | 4685.3 | 11.8 | Ht |
| | 4649.3 | 10.9 | Sm | 4696.2 | 12.2 | Ht |
| | 4651.3 | 11.5 | En | 4697.2 | 12.6 | Sm |
| | 4656.2 | 10.8 | Ht | | | |
| *073173* S VOLANTIS— | | | | | | |
| | 4649.1 | 12.3 | Bl | 4667.9 | 12.8 | Bl |
| *074241* W PUPPIS— | | | | | | |
| | 4640.3 | 10.1 | Sm | 4667.2 | 11 9 | Ht |
| | 4640.2 | 10.1 | Ht | 4668.2 | 12.2 | Sm |
| | 4648.4 | 11.7 | Sm | 4674.9 | 11.7 | Bl |
| | 4649.1 | 11.0 | Bl | 4679.2 | 11.6 | Ht |
| | 4650.2 | 11.5 | Ht | 4681.9 | 10.9 | Bl |
| | 4656 2 | 11.2 | Ht | 4693.2 | 9.2 | Ht |
| | 4660.3 | 11.2 | Sm | 4696.2 | 9.2 | Ht |
| | 4663.2 | 11.9 | Ht | 4696.9 | 9.0 | Bl |
| | 4663.9 | 11.9 | Bl | | | |
| 074922 U GEMINORUM— | | | | | | |
| | 4667.1 | [10.1 | Ch | 4674.1 | [10.1 | Ch |
| | 4668.1 | [10.1 | Ch | | | |
| 081112 R CANCRI— | | | | | | |
| | 4667.1 | 8.3 | Ch | 4674.1 | 8.5 | Ch |
| 081617 V CANCRI— | | | | | | |
| | 4674.1 | 8.9 | Ch | | | |
| *082476* R CHAMAELONTIS— | | | | | | |
| | 4626.3 | 8.7 | En | 4668.2 | 8.7 | En |
| | 4640.3 | 8.7 | Sm | 4668.3 | 8.4 | Sm |
| | 4647.3 | 8.8 | En | 4674.9 | 8.7 | Bl |
| | 4648.4 | 8.8 | Sm | 4675.2 | 8.7 | En |
| | 4649.1 | 8.7 | Bl | 4681.2 | 8.8 | En |
| | 4651.3 | 8.9 | En | 4681.9 | 8.4 | Bl |
| | 4653.2 | 8.4 | Sm | 4688.2 | 9.5 | En |
| | 4657.3 | 9.6 | En | 4695.2 | 9.5 | En |
| | 4660.3 | 8.4 | Sm | 4696.3 | 9.0 | Sm |
| | 4663.9 | 8.6 | Bl | 4696.9 | 9.6 | Bl |
| 084803 S HYDRAE— | | | | | | |
| | 4667.1 | 10.2 | Ch | 4674.1 | 9.6 | Ch |
| *085008* T HYDRAE— | | | | | | |
| | 4667.1 | 7.8 | Ch | 4674.1 | 8.4 | Ch |
| 085120 T CANCRI— | | | | | | |
| | 4667.1 | 9.2 | Ch | 4674.1 | 9.2 | Ch |
| *090031* T PYXIDIS— | | | | | | |
| | 4651.0 | [u | Bl | 4667.9 | [u | Bl |
| 090151 V URSAE MAJORIS— | | | | | | |
| | 4697.6 | 10.2 | Cu | 4716.6 | 10.2 | Cu |
| 090425 W CANCRI— | | | | | | |
| | 4679.7 | 10.2 | Wf | | | |
| *091868* RW CARINAE— | | | | | | |
| | 4649.1 | 11.4 | Bl | 4664.0 | 12.0 | Bl |
| *092551* Y VELORUM— | | | | | | |
| | 4648.3 | [12.4 | Sm | 4669.2 | [12.4 | Sm |
| | 4651.0 | [12.9 | Bl | 4697.2 | [12.4 | Sm |
| | 4667.9 | [12.9 | Bl | | | |
| *092962* R CARINAE— | | | | | | |
| | 4640.3 | 9.2 | Ht | 4669.2 | 8.2 | Sm |
| | 4642.3 | 9.1 | En | 4671.2 | 8.2 | Ht |
| | 4647.3 | 9.0 | En | 4674.9 | 7.8 | Bl |
| | 4648.3 | 9.0 | Sm | 4675.2 | 7.3 | En |
| | 4648.4 | 8.9 | Ht | 4679.2 | 8.1 | Ht |
| | 4649.1 | 9.0 | Bl | 4681.2 | 7.3 | En |
| | 4651.3 | 8.9 | En | 4681.9 | 6.8 | Bl |
| | 4656 2 | 8.8 | Ht | 4685.3 | 6.9 | Ht |
| | 4658.2 | 8.4 | En | 4688.2 | 6.6 | En |
| | 4660.3 | 8.5 | Sm | 4693.2 | 6.3 | Ht |
| | 4664.0 | 8.2 | Bl | 4695.3 | 6.0 | En |
| | 4667.2 | 8.4 | Ht | 4696.2 | 6.0 | Ht |
| | 4668.3 | 8.2 | En | 4696.9 | 5.7 | Bl |
| | 4669.2 | 8.2 | Sm | 4697.2 | 5.8 | Sm |
| *093014* X HYDRAE— | | | | | | |
| | 4667.1 | [10.2 | Ch | | | |
| 093934 R LEONIS MINORIS— | | | | | | |
| | 4667.1 | 7.6 | Ch | 4695.6 | 8.3 | Pt |
| | 4674.1 | 7.5 | Ch | 4706.1 | 9.2 | Ch |
| 094211 R LEONIS— | | | | | | |
| | 4555.2 | 5.9 | Ku | 4591.3 | 6.2 | Ku |
| | 4556.2 | 5.9 | Ku | 4592.3 | 6.2 | Tc |
| | 4557.2 | 5.8 | Ku | 4593.3 | 6.1 | Tc |
| | 4558.3 | 5.9 | Ku | 4595.3 | 6.2 | Tc |
| | 4559.2 | 5.9 | Ku | 4596.2 | 6.9 | Vv |
| | 4560.2 | 5.6 | Tc | 4615.4 | 6.8 | Vv |
| | 4561.3 | 5.6 | Tc | 4616.4 | 6.9 | Vv |
| | 4562.3 | 5.6 | Tc | 4618.4 | 6.7 | Vv |
| | 4563.5 | 5.5 | Tc | 4620.3 | 6.9 | Vv |
| | 4564.3 | 5.3 | Tc | 4621.4 | 6.8 | Vv |
| | 4568.3 | 5.8 | Ku | 4633.4 | 7.2 | Vv |
| | 4578.4 | 6.5 | Vv | 4666.1 | 8.1 | Ch |
| | 4578.4 | 5.8 | Ku | 4672.6 | 8.2 | Mm |
| | 4581.3 | 5.9 | Vv | 4673.1 | 8.4 | Ch |
| | 4586.4 | 6.1 | Vv | 4684.7 | 8.3 | Wb |
| | 4589.3 | 6.0 | Vv | 4687.6 | 7.6 | Pw |
| | 4589.3 | 6.1 | Ku | 4695.6 | 9.0 | Pt |
| | 4591.3 | 6.1 | Tc | | | |
| 094512 X LEONIS— | | | | | | |
| | 4697.6 | [11.8 | Cu | | | |
| *094954* Z VELORUM— | | | | | | |
| | 4640.3 | 10.9 | Ht | 4668.3 | 12.2 | En |
| | 4644.3 | 11.9 | En | 4669.2 | 12.5 | Sm |
| | 4547.2 | 12.0 | En | 4671.2 | 12.3 | Ht |
| | 4548.3 | 11.2 | Sm | 4674.9 | 12.3 | Bl |
| | 4648.4 | 12.1 | Ht | 4675.3 | 12.2 | En |
| | 4649.1 | 11.4 | Bl | 4679.2 | 12.5 | Ht |
| | 4651.3 | 12.0 | En | 4685.3 | [12.1 | Ht |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.C.D. | Est. | Obs. | J.C.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| *094954* Z VELORUM—Continued. | | | | | | |
| | 4656.2 | 12.1 | Ht | 4693.2 | [12.1 | Ht |
| | 4657.3 | 12.0 | En | 4696.3 | [12.2 | En |
| | 4664.0 | 11.1 | Bl | 4697.2 | [12.1 | Sm |
| | 4667.2 | 12.3 | Ht | | | |
| 095421 V LEONIS— | | | | | | |
| | 4671.1 | 9.4 | Ch | 4696.6 | 10.2 | Cy |
| | 4679.7 | 9.4 | Wf | 4706.6 | 10.2 | Cy |
| | 4695 6 | 10.0 | Pt | | | |
| *095563* RV CARINAE— | | | | | | |
| | 4649.1 | 12.2 | Bl | 4667.9 | 12.9 | Bl |
| *100661* S CARINAE— | | | | | | |
| | 4640.3 | 6.0 | Ht | 4671.2 | 7.8 | Ht |
| | 4642.3 | 6.0 | En | 4674.9 | 7.9 | Bl |
| | 4647.3 | 6.1 | En | 4675.3 | 8.0 | En |
| | 4648.3 | 6.3 | Sm | 4679.2 | 8 3 | Ht |
| | 4648.4 | 6.5 | Ht | 4681.2 | 8.4 | En |
| | 4649.1 | 6.3 | Bl | 4681.2 | 8.3 | Bl |
| | 4651.3 | 6.4 | En | 4685.3 | 9.0 | Ht |
| | 4656.2 | 6.7 | Ht | 4688.2 | 8.5 | En |
| | 4658.2 | 6.7 | En | 4693.2 | 8.9 | Ht |
| | 4660.3 | 6.8 | Sm | 4695.3 | 8.4 | En |
| | 4664.0 | 6.9 | Bl | 4696.2 | 8.3 | Ht |
| | 4667.2 | 7.7 | Ht | 4696.9 | 8.3 | Bl |
| | 4668.3 | 7.8 | En | 4697.2 | 7.8 | Sm |
| | 4669.2 | 7.5 | Sm | | | |
| *101058* Z CARINAE— | | | | | | |
| | 4644.2 | [12.3 | En | 4667.9 | [12.6 | Bl |
| | 4651.0 | [12.6 | Bl | 4697.3 | [12.3 | Sm |
| | 4658.2 | [12.3 | En | | | |
| *101153* W VELORUM— | | | | | | |
| | 4651.0 | 12.8 | Bl | 4697.2 | [12.0 | Sm |
| | 4669.3 | [13.0 | Sm | | | |
| *103212* U HYDRAE— | | | | | | |
| | 4592.3 | 5.8 | Tc | 4595.3 | 5.4 | Tc |
| | 4593.2 | 5.8 | Tc | | | |
| 103769 R URSAE MAJORIS— | | | | | | |
| | 4678.7 | 12.7 | Wf | 4700.7 | 12.2 | Wf |
| | 4694.7 | 12.4 | Wf | 4704.6 | 11.7 | Cy |
| | 4695.6 | 12.0 | Pt | 4704.8 | 11.9 | Wf |
| | 4695.6 | 12.3 | Ie | 4709.6 | 11.8 | Cy |
| | 4697.7 | 11.4 | Jo | 4727.6 | 9.2 | Pt |
| *104620* W HYDRAE— | | | | | | |
| | 4649.1 | 9.0 | Bl | 4674.9 | 8.8 | Bl |
| | 4664.0 | 8.8 | Bl | 4681.9 | 8.6 | Bl |
| | 4667.1 | 9.1 | Ch | 4696.9 | 8.6 | Bl |
| | 4674.1 | 9.1 | Ch | | | |
| *104628* RS HYDRAE— | | | | | | |
| | 4649.1 | 11.6 | Bl | 4681.9 | 9.3 | Bl |
| | 4664.0 | 10.3 | Bl | 4696.9 | 9.6 | Bl |
| *110361* RS CARINAE— | | | | | | |
| | 4644.3 | [12.1 | En | 4669.3 | [12.3 | Sm |
| | 4648.3 | [12.3 | Sm | 4681.2 | [12.1 | En |
| | 4658.2 | [12.1 | En | 4697.2 | [12.3 | Sm |
| *111561* RY CARINAE— | | | | | | |
| | 4651.0 | [13.5 | Bl | 4667.9 | [13.5 | Bl |
| *111661* RS CENTAURI— | | | | | | |
| | 4648.3 | 12.7 | Sm | 4674.9 | 10.0 | Bl |
| | 4651.0 | 12.1 | Bl | 4681.9 | 9.2 | Bl |
| | 4664.0 | 11.1 | Bl | 4696.9 | 8.8 | Bl |
| | 4669.3 | 10.6 | Sm | 4697.2 | 9.2 | Sm |
| *114441* X CENTAURI— | | | | | | |
| | 4649.1 | 7.2 | Bl | 4681.9 | 7.2 | Bl |
| | 4664.0 | 7.0 | Bl | 4696.9 | 7.8 | Bl |
| *115058* W CENTAURI— | | | | | | |
| | 4649.1 | 8.2 | Bl | 4681.9 | 9.0 | Bl |
| | 4664.0 | 8.2 | Bl | 4696.9 | 10.0 | Bl |
| | 4674.9 | 8.5 | Bl | | | |
| 115919 R COMAE— | | | | | | |
| | 4679.7 | 9.2 | Wf | 4703.7 | 9.7 | Wf |
| | 4691.6 | 9.3 | Cl | 4705.7 | 9.9 | Wf |
| | 4695.6 | 9.6 | Pt | 4727.6 | 10.6 | Pt |
| | 4695.7 | 9.6 | Wf | | | |
| 120012 SU VIRGINIS— | | | | | | |
| | 4708.7 | [12.3 | Cy | | | |
| *120905* T VIRGINIS— | | | | | | |
| | 4695.6 | 11.4 | Pt | | | |
| *121418* R CORVI— | | | | | | |
| | 4676.4 | 8.5 | An | 4695.6 | 7.0 | Pt |
| | 4676.4 | 8.5 | L | 4701.4 | 6.5 | L |
| | 4688.4 | 7.1 | L | | | |
| 122001 SS VIRGINIS— | | | | | | |
| | 4676.4 | 7.9 | L | 4697.4 | 7.7 | Be |
| | 4676.4 | 8.2 | An | 4697.5 | 8.5 | An |
| | 4688.4 | 7.6 | L | 4707.4 | 7.6 | L |
| | 4688.4 | 7.7 | An | 4716.3 | 7.8 | L |
| | 4697.4 | 7.8 | L | | | |
| 122532 T CANUM VENATICORUM— | | | | | | |
| | 4688.6 | 9.9 | Cl | 4707.6 | 9.5 | Pc |
| | 4692.5 | 9.8 | Lp | 4708.7 | 9.8 | Gs |
| | 4695.6 | 10.0 | Pt | 4727.6 | 9.4 | Pt |
| 122803 Y VIRGINIS— | | | | | | |
| | 4673.5 | 10.4 | L | 4694.4 | 12.5 | L |
| *122854* U CENTAURI— | | | | | | |
| | 4651.0 | 13.0 | Bl | 4667.9 | 13.5 | Bl |
| 123160 T URSAE MAJORIS— | | | | | | |
| | 4673.2 | 11.3 | Ch | 4700.7 | 12.4 | Wf |
| | 4678.7 | 11.2 | Wf | 4704.8 | 12.6 | Wf |
| | 4694.7 | 12.4 | Wf | 4706.8 | [12.2 | Sg |
| | 4695.6 | 12.3 | Pt | 4727.6 | 12.7 | Pt |
| | 4695.7 | 12.3 | Cy | | | |
| 123307 R VIRGINIS— | | | | | | |
| | 4668.2 | 7.1 | Ch | 4697.4 | 7.8 | An |
| | 4676.4 | 7.3 | L | 4697.4 | 7.7 | Be |
| | 4676.4 | 7.2 | An | 4706.2 | 7.9 | Ch |
| | 4688.4 | 7.2 | L | 4706.7 | 8.1 | Cy |
| | 4688.4 | 7.3 | An | 4707.4 | 7.9 | L |
| | 4695.6 | 7.3 | Pt | 4716.3 | 8.9 | L |
| | 4697.4 | 7.7 | L | | | |
| 123459 RS URSAE MAJORIS— | | | | | | |
| | 4679.7 | 13.8 | Wf | 4700.7 | 13.1 | Wf |
| | 4694.7 | 13.2 | Lv | 4704.6 | 12.8 | Cy |
| | 4695.6 | 13.8 | Pt | 4705.7 | 12.7 | Wf |
| | 4695.7 | 13.5 | Cy | 4708.7 | 12.8 | Cy |
| | 4695.7 | 13.4 | Wf | 4727.6 | 10.0 | Pt |
| 123961 S URSAE MAJORIS— | | | | | | |
| | 4668.2 | 8.5 | Ch | 4700.4 | 8.2 | L |
| | 4671.7 | 8.6 | Mm | 4700.7 | 8.3 | Wf |
| | 4673.9 | 8.8 | Ik | 4701.7 | 8.1 | Cm |
| | 4676.6 | 8.3 | An | 4702.5 | 7.9 | Lp |
| | 4676.4 | 8.2 | L | 4703.7 | 8.3 | Wb |
| | 4677.0 | 8.4 | Ik | 4704.8 | 8.2 | Wf |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| 123961 S URSAE MAJORIS—Continued. | | | | | | |
| | 4677.7 | 8.5 | Wb | 4705.7 | [10.6 | Gs |
| | 4678.7 | 8.7 | Wf | 4706.1 | 8.3 | Ch |
| | 4679.0 | 8.3 | Ik | 4707.6 | 8.0 | Jo |
| | 4679.2 | 8.4 | Ch | 4708.3 | 7.8 | Ro |
| | 4675.0 | 8.5 | Ik | 4709.6 | 8.5 | Jn |
| | 4684.0 | 7.9 | Ik | 4710.7 | 8.0 | Wb |
| | 4684.7 | 8.6 | Wb | 4711.3 | 7.8 | Ro |
| | 4687.6 | 8.1 | Pw | 4713.6 | 8.1 | Cm |
| | 4690.0 | 7.9 | Ik | 4715.5 | 7.5 | L |
| | 4690.4 | 8.1 | L | 4716.7 | 8.0 | Sg |
| | 4690.6 | 8.2 | Cy | 4716.7 | 8.0 | Gl |
| | 4692.0 | 7.9 | Ik | 4718.6 | 7.7 | Jo |
| | 4692.5 | 8.3 | Lp | 4718.7 | 7.1 | Cy |
| | 4694.7 | 8.2 | Lv | 4720.7 | 8.0 | Gl |
| | 4694.7 | 8.4 | Wf | 4722.6 | 7.7 | Pw |
| | 4695.4 | 8.6 | An | 4723.7 | 8.0 | Gl |
| | 4695.6 | 8.1 | Pt | 4723.7 | 8.0 | Gl |
| | 4695.6 | 7.9 | Jn | 4724.4 | 8.0 | Lp |
| | 4697.7 | 8.2 | Jo | 4727.4 | 8.1 | An |
| | 4699.0 | 7.8 | Ik | 4727.7 | 8.0 | Gl |
| 124204 RU VIRGINIS— | | | | | | |
| | 4695.6 | 10.1 | Pt | 4727.6 | 8.5 | Pt |
| | 4706.7 | 10.4 | Cy | | | |
| 124606 U VIRGINIS— | | | | | | |
| | 4695.6 | 8.0 | Pt | 4706.7 | 7.9 | Cy |
| *131283* U OCTANTIS— | | | | | | |
| | 4640.3 | 7.8 | Sm | 4668.3 | 9.4 | Sm |
| | 4640.3 | 6.8 | Ht | 4671.2 | 9.6 | Ht |
| | 4648.4 | 8.6 | Ht | 4674.9 | 10.0 | Bl |
| | 4649.3 | 8.2 | Sm | 4696.9 | 11.1 | Bl |
| | 4651.0 | 8.5 | Bl | 4697.3 | 11.0 | Sm |
| | 4656.4 | 9.2 | Ht | 4681.9 | 10.2 | Bl |
| | 4660.0 | 8.7 | Sm | 4685.3 | 10.5 | Ht |
| | 4664.0 | 8.5 | Bl | 4696.2 | 10.9 | Ht |
| | 4667.2 | 9.4 | Ht | 4696.9 | 11.1 | Bl |
| *132202* V VIRGINIS— | | | | | | |
| | 4706.7 | 9.5 | Cy | | | |
| *132422* R HYDRAE— | | | | | | |
| | 4640.3 | 7.1 | Sm | 4677.4 | 4.9 | Be |
| | 4643.2 | 7.3 | En | 4679.1 | 5.2 | Ch |
| | 4647.2 | 7.0 | En | 4681.9 | 4.8 | Bl |
| | 4649.2 | 7.3 | Sm | 4682.2 | 4.8 | En |
| | 4651.0 | 7.1 | Bl | 4682.4 | 4.6 | Be |
| | 4652.2 | 6.8 | En | 4683.4 | 4.7 | Be |
| | 4656.3 | 6.8 | En | 4695.1 | 4.7 | Ch |
| | 4664.0 | 5.6 | Bl | 4695.2 | 4.6 | En |
| | 4666.2 | 5.8 | Ch | 4695.4 | 4.7 | L |
| | 4668.3 | 5.8 | En | 4695.5 | 4.7 | An |
| | 4669.2 | 5.8 | Sm | 4695.4 | 4.6 | Be |
| | 4670.1 | 5.4 | Ch | 4695.6 | 5.1 | Pt |
| | 4672.4 | 5.1 | Be | 4696.3 | 4.4 | Sm |
| | 4673.4 | 4.8 | L | 4696.9 | 4.9 | Bl |
| | 4676.3 | 4.9 | En | 4700.4 | 4.6 | Be |
| | 4676.4 | 5.1 | An | 4707.4 | 4.3 | Be |
| | 4676.4 | 5.0 | Be | 4707.4 | 4.5 | L |
| *132706* S VIRGINIS— | | | | | | |
| | 4640.3 | 7.1 | Sm | 4694.7 | 8.1 | Wf |
| | 4649.2 | 6.8 | Sm | 4695.6 | 8.2 | Pt |
| | 4668.2 | 7.3 | Ch | 4696.7 | 8.0 | Cy |
| | 4669.2 | 7.1 | Sm | 4697.7 | 8.1 | Wb |
| *132706* S VIRGINIS—Continued. | | | | | | |
| | 4672.6 | 7.7 | Mm | 4706.2 | 8.6 | Ch |
| | 4678.7 | 7.8 | Wf | 4727.6 | 9.3 | Pt |
| | 4685.2 | 8.0 | Ch | | | |
| *133155* RV CENTAURI— | | | | | | |
| | 4651.0 | 9.0 | Bl | 4681.9 | 9.4 | Bl |
| | 4664.0 | 8.8 | Bl | 4696.9 | 9.2 | Bl |
| 133273 T URSAE MINORIS— | | | | | | |
| | 4679.7 | 14.0 | Wf | 4694.7 | 14.7 | Wf |
| | 4688.6 | 10,8 | Cl | 4700.7 | 14.2 | Wf |
| | 4694.7 | 13.5 | Lv | 4705.7 | 14.2 | Wf |
| *133633* T CENTAURI— | | | | | | |
| | 4640.3 | 7.2 | Sm | 4669.2 | 6.9 | En |
| | 4643.2 | 7.1 | En | 4671.2 | 6.5 | Ht |
| | 4647.3 | 7.2 | En | 4676.2 | 6.6 | En |
| | 4649.2 | 7.4 | Sm | 4681.9 | 6.3 | Bl |
| | 4651.0 | 7.0 | Bl | 4682.2 | 6.0 | En |
| | 4651.2 | 7.4 | Sm | 4685.4 | 6.1 | Ht |
| | 4651.3 | 6.9 | En | 4696.2 | 6.2 | En |
| | 4656.3 | 7.1 | En | 4697.0 | 5.9 | Bl |
| | 4664.0 | 6.7 | Bl | | | |
| *134236* RT CENTAURI— | | | | | | |
| | 4651.0 | 10.4 | Bl | 4681.9 | 9.2 | Bl |
| | 4664.0 | 9.7 | Bl | 4697.0 | 9.3 | Bl |
| 134440 R CANUM VENATICORUM— | | | | | | |
| | 4692.5 | 9.6 | Lp | 4716.7 | 9.0 | Lv |
| | 4692.7 | 9.9 | Lv | 4724.4 | 8.6 | Lp |
| | 4695.6 | 9.3 | Pt | 4727.6 | 8.4 | Pt |
| | 4701.6 | 8.8 | Ie | | | |
| *134536* RX CENTAURI— | | | | | | |
| | 4651.0 | [13.1 | Bl | 4681.9 | 10.6 | Bl |
| | 4667.9 | 12.5 | Bl | 4697.0 | 9.6 | Bl |
| *134677* T APODIS— | | | | | | |
| | 4640.3 | 9.7 | Sm | 4669.2 | 10.0 | Sm |
| | 4649.3 | 9.6 | Sm | 4681.9 | 9.8 | Bl |
| | 4651.0 | 8.9 | Bl | 4696.9 | 10.9 | Bl |
| | 4660.3 | 9.5 | Sm | 4697.2 | 11.7 | Sm |
| | 4664.0 | 9.3 | Bl | | | |
| 135908 RR VIRGINIS— | | | | | | |
| | 4695.6 | 12.1 | Pt | | | |
| *140528* RU HYDRAE— | | | | | | |
| | 4640.2 | 12.0 | Sm | 4667.9 | 13.0 | Bl |
| | 4643.2 | 11.4 | En | 4668.2 | 12.9 | Sm |
| | 4647.3 | 12.0 | En | 4668.3 | 12.3 | En |
| | 4649.3 | 12.0 | Sm | 4676.2 | 12.5 | En |
| | 4651.0 | 12.2 | Bl | 4682.2 | 12.5 | En |
| | 4652.2 | 12.0 | En | 4695.2 | 12.5 | En |
| *140959* R CENTAURI— | | | | | | |
| | 4639.2 | 6.1 | En | 4671.2 | 6.8 | Ht |
| | 4640.2 | 6.5 | Sm | 4676.2 | 7.6 | En |
| | 4644.2 | 6.1 | En | 4679.2 | 7.0 | Ht |
| | 4649.3 | 6.5 | Sm | 4682.0 | 7.7 | Bl |
| | 4651.0 | 6.7 | Bl | 4682.3 | 7.6 | En |
| | 4651.2 | 6.2 | En | 4685.3 | 7.5 | Ht |
| | 4653.2 | 6.4 | En | 4687.2 | 8.1 | En |
| | 4657.2 | 6.5 | En | 4693.2 | 7.6 | Ht |
| | 4660.2 | 6.4 | Sm | 4695.3 | 8.0 | En |
| | 4664.0 | 7.1 | Bl | 4696.2 | 7.8 | Ht |
| | 4668.2 | 6.9 | Sm | 4696.9 | 7.9 | Bl |
| | 4668.3 | 7.1 | En | | | |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| 141567 U URSAE MINORIS— | | | | | | |
| | 4692.7 | 12.0 | Lv | 4709.6 | 11.0 | Jo |
| | 4695.6 | 12.2 | Pt | 4710.7 | 11.2 | Wb |
| | 4701.7 | 11.0 | Jo | 4716.6 | 10.9 | Jo |
| | 4703.7 | 11.0 | Wb | 4716.7 | 11.1 | Lv |
| | 4704.7 | 11.2 | Gs | 4727.6 | 10.9 | Pt |
| | 4708.7 | 11.2 | Gs | | | |
| 141954 S BOOTIS— | | | | | | |
| | 4676.4 | 9.4 | L | 4700.4 | 10.4 | L |
| | 4679.2 | 9.5 | Ch | 4701.6 | 10.3 | Ie |
| | 4688.4 | 9.6 | L | 4706.8 | 10.5 | Sg |
| | 4688.7 | 10.0 | Jo | 4709.7 | 10.5 | Jo |
| | 4695.6 | 10.0 | Pt | 4715.5 | 11.5 | L |
| | 4696.7 | 9.9 | Cy | 4727.6 | 11.6 | Pt |
| | 4697.8 | 10.4 | Jo | | | |
| 142205 RS VIRGINIS— | | | | | | |
| | 4708.7 | 13.2 | Cy | | | |
| 142539a V BOOTIS— | | | | | | |
| | 4640.7 | 9.3 | Sg | 4704.7 | 7.4 | Gb |
| | 4673.4 | 7.7 | L | 4704.7 | 7.5 | Cy |
| | 4679.2 | 7.9 | Ch | 4706.5 | 7.4 | Lp |
| | 4688.4 | 7.2 | L | 4708.3 | 7.7 | Ro |
| | 4690.6 | 7.3 | Cy | 4708.7 | 7.9 | Cy |
| | 4692.5 | 7.4 | Lp | 4709.7 | 7.7 | Jo |
| | 4695.6 | 7.6 | Pt | 4711.3 | 7.6 | Ro |
| | 4695.7 | 7.2 | Cy | 4712.6 | 7.4 | Cy |
| | 4697.4 | 7.1 | L | 4713.7 | 7.4 | Jo |
| | 4697.4 | 6.6 | An | 4714.6 | 7.2 | L |
| | 4697.7 | 7.7 | Jo | 4718.6 | 7.7 | Cy |
| | 4699.3 | 7.8 | Ch | 4718.7 | 7.0 | Jo |
| | 4702.4 | 6.5 | An | 4724.4 | 7.5 | Lp |
| | 4702.4 | 7.5 | Be | 4727.6 | 7.6 | Pt |
| | 4702.4 | 7.6 | L | | | |
| 143227 R BOOTIS— | | | | | | |
| | 4640.7 | 8.6 | Sg | 4700.8 | 12.2 | Wf |
| | 4675.7 | 10.7 | Wf | 4701.6 | 12.0 | Ie |
| | 4679.2 | 10.8 | Ch | 4704.8 | 12.3 | Wf |
| | 4681.8 | 11.0 | Wf | 4616.5 | 7.5 | Pg |
| | 4694.8 | 11.9 | Wf | 4717.2 | [10.9 | Ch |
| | 4695.6 | 11.9 | Pt | 4720.3 | 8.1 | Pg |
| | 4696.7 | 11.9 | Cy | 4727.6 | 12.4 | Pt |
| 144918 U BOOTIS— | | | | | | |
| | 4675.7 | 11.0 | Wf | 4704.7 | 10.7 | Cy |
| | 4681.8 | 10.7 | Wf | 4704.8 | 10.6 | Wf |
| | 4694.8 | 10.5 | Wf | 4708.7 | 10.7 | Cy |
| | 4696.6 | 10.5 | Cu | 4712.7 | 10.8 | Cy |
| | 4696.7 | 10.4 | Cy | 4713.6 | 10.8 | Cu |
| | 4697.6 | 10.5 | Cu | 4716.6 | 10.9 | Cu |
| | 4700.8 | 10.8 | Wf | 4720.6 | 11.3 | Cu |
| *145254* Y LUPI— | | | | | | |
| | 4640.2 | [12.8 | Sm | 4668.2 | 10.3 | Sm |
| | 4649.3 | [12.8 | Sm | 4682.0 | 10.1 | Bl |
| | 4651.0 | 12.6 | Bl | 4696.2 | 10.0 | Sm |
| | 4664.0 | 10.6 | Bl | 4696.9 | 10.1 | Bl |
| *145971* S APODIS— | | | | | | |
| | 4640.3 | 10.4 | Sm | 4664.0 | 10.0 | Bl |
| | 4642.3 | 10.2 | En | 4669.2 | 10.4 | Sm |
| | 4648.3 | 9.9 | En | 4670.3 | 10.0 | En |
| | 4649.3 | 10.4 | Sm | 4682.0 | 10.0 | Bl |
| | 4651.0 | 10.0 | Bl | 4682.3 | 9.9 | En |
| | 4653.2 | 9.9 | Sm | 4675.3 | 10.0 | En |
| *145971* S APODIS—Continued. | | | | | | |
| | 4657.2 | 9.8 | En | 4696.3 | 10.4 | En |
| | 4660.3 | 10.4 | Sm | 4696.9 | 10.0 | Bl |
| *150018* RT LIBRAE— | | | | | | |
| | 4695.6 | 12.5 | Pt | | | |
| *150519* T LIBRAE— | | | | | | |
| | 4695.6 | 11.3 | Pt | 4727.6 | 11.8 | Pt |
| *150605* Y LIBRAE— | | | | | | |
| | 4673.4 | 12.8 | L | 4707.4 | 9.7 | Be |
| | 4694.4 | 10.5 | L | 4707.4 | 9.7 | L |
| | 4695.6 | 10.4 | Pt | 4720.4 | 9.5 | L |
| | 4707.4 | 10.1 | An | 4727.6 | 12.8 | Pt |
| *151520* S LIBRAE— | | | | | | |
| | 4676.4 | 9.4 | L | 4707.4 | 8.2 | Be |
| | 4676.4 | 9.5 | An | 4707.4 | 8.1 | L |
| | 4688.4 | 8.4 | L | 4711.2 | 8.4 | Ch |
| | 4697.4 | 8.2 | L | 4720.4 | 8.0 | L |
| | 4707.4 | 8.9 | An | 4727.6 | 8.3 | Pt |
| 151714 S SERPENTIS— | | | | | | |
| | 4673.5 | 11.7 | L | 4701.7 | 11.9 | Ie |
| | 4678.8 | 12.0 | Wf | 4705.8 | 11.6 | Wf |
| | 4688.4 | 11.9 | L | 4706.8 | 11.7 | Cy |
| | 4695.7 | 11.8 | Wf | 4707.4 | 11.6 | An |
| | 4695.7 | 11.8 | Pt | 4707.4 | 11.8 | L |
| | 4696.6 | 11.8 | Cu | 4713.6 | 11.5 | Cu |
| | 4697.4 | 11.9 | L | 4716.6 | 11.6 | Cu |
| | 4697.4 | 11.8 | An | 4720.4 | 11.2 | L |
| | 4697.6 | 11.6 | Cu | 4720.6 | 11.5 | Cu |
| | 4700.8 | 11.7 | Wf | 4727.6 | 11.2 | Pt |
| 151731 S CORONAE BOREALIS— | | | | | | |
| | 4640.7 | 11.0 | Sg | 4704.8 | 12.9 | Wf |
| | 4678.7 | 12.2 | Wf | 4706.7 | 12.7 | Cy |
| | 4694.8 | 12.5 | Wf | 4711.6 | 12.4 | Cl |
| | 4695.7 | 12.3 | Pt | 4727.6 | 12.5 | Pt |
| | 4700.8 | 12.8 | Wf | | | |
| *151822* RS LIBRAE— | | | | | | |
| | 4648.3 | 11.4 | Sm | 4687.3 | 9.8 | En |
| | 4651.0 | 11.0 | Bl | 4688.4 | 9.4 | L |
| | 4653.2 | 11.2 | Sm | 4693.2 | 8.9 | Ht |
| | 4653.3 | 10.8 | En | 4696.2 | 9.1 | Ht |
| | 4660.3 | 10.4 | Sm | 4696.3 | 8.6 | En |
| | 4664.0 | 9.7 | Bl | 4697.0 | 8.7 | Bl |
| | 4668.2 | 10.2 | Sm | 4697.2 | 9.4 | Sm |
| | 4670.3 | 10.2 | En | 4697.4 | 8.7 | L |
| | 4671.3 | 10.1 | Ht | 4702.4 | 8.6 | An |
| | 4673.5 | 10.9 | L | 4702.4 | 8.8 | Be |
| | 4678.2 | 10.0 | En | 4702.4 | 8.8 | L |
| | 4682.0 | 9.8 | Bl | 4716.3 | 8.6 | L |
| | 4685.3 | 9.8 | Ht | | | |
| *152714* RU LIBRAE— | | | | | | |
| | 4673.4 | 14.0 | L | 4707.4 | 13.0 | L |
| | 4694.4 | [14.2 | L | 4727.6 | 11.4 | Pt |
| | 4695.7 | 13.5 | Pt | 4728.4 | 12.6 | L |
| | 4696.4 | [13.8 | L | | | |
| *152849* R NORMAE— | | | | | | |
| | 4644.3 | 12.0 | En | 4671.2 | 11.0 | En |
| | 4649.3 | 12.8 | Sm | 4676.3 | 10.4 | En |
| | 4650.2 | 12.0 | En | 4682.0 | 9.2 | Bl |
| | 4651.0 | 12.3 | Bl | 4682.2 | 9.4 | En |
| | 4664.0 | 11.5 | Bl | 4696.2 | 8.0 | Sm |
| | 4668.2 | 11.2 | Sm | 4696.2 | 8.2 | En |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| *153020* X LIBRAE— | | | | | | |
| | 4651.0 | 12.0 | Bl | 4682.0 | 11.3 | Bl |
| | 4667.9 | 11.5 | Bl | 4697.0 | 11.5 | Bl |
| *153215* W LIBRAE— | | | | | | |
| | 4651.0 | 13.5 | Bl | 4697.0 | 11.3 | Bl |
| | 4667.9 | 11.6 | Bl | 4697.7 | 11.5 | Cu |
| | 4682.0 | 11.5 | Bl | 4728.4 | 12.5 | L |
| | 4696.7 | 11.5 | Cu | | | |
| 153378 S URSAE MINORIS— | | | | | | |
| | 4668.1 | 10.6 | Ch | 4700.8 | 11.5 | Wf |
| | 4678.7 | 10.8 | Wf | 4704.8 | 11.6 | Wf |
| | 4694.8 | 11.4 | Wf | 4708.3 | 10.6 | Ro |
| | 4695.7 | 11.3 | Pt | 4718.6 | 12.0 | Cy |
| | 4695.7 | 11.5 | Cy | | | |
| *153620a* U LIBRAE— | | | | | | |
| | 4651.0 | 11.0 | Bl | 4667.9 | 12.0 | Bl |
| *153654* T NORMAE— | | | | | | |
| | 4638.2 | 10.5 | Sm | 4679.2 | 6.7 | Ht |
| | 4649.3 | 9.7 | Sm | 4685.3 | 6.3 | Ht |
| | 4660.3 | 7.7 | Sm | 4693.2 | 5.9 | Ht |
| | 4668.2 | 7.5 | Sm | 4696.2 | 7.0 | Sm |
| | 4671.2 | 7.0 | Ht | 4696.2 | 6.3 | Ht |
| *154020* Z LIBRAE— | | | | | | |
| | 4651.0 | [12.7 | Bl | 4667.9 | 13.5 | Bl |
| 154428 R CORONAE BOREALIS— | | | | | | |
| | 4564.1 | 5.7 | Tc | 4706.7 | 5.9 | Cy |
| | 4591.3 | 6.1 | Tc | 4706.7 | 6.1 | Pw |
| | 4592.3 | 6.0 | Tc | 4706.8 | 6.0 | Sg |
| | 4593.3 | 5.8 | Tc | 4706.8 | 6.2 | Wf |
| | 4595.3 | 6.0 | Tc | 4707.4 | 6.3 | An |
| | 4637.8 | 6.3 | Sg | 4707.4 | 6.0 | L |
| | 4640.7 | 6.5 | Sg | 4707.4 | 6.3 | Be |
| | 4666.1 | 6.0 | Ch | 4707.7 | 6.2 | Wb |
| | 4672.5 | 6.0 | L | 4707.7 | 6.0 | Pc |
| | 4673.2 | 6.0 | Ch | 4707.8 | 6.2 | Wf |
| | 4673.5 | 5.9 | L | 4707.8 | 6.2 | Pt |
| | 4675.6 | 6.0 | Jn | 4708.3 | 6.0 | Ro |
| | 4676.4 | 6.0 | L | 4708.7 | 6.0 | Cy |
| | 4676.4 | 6.0 | An | 4708.7 | 5.9 | Pc |
| | 4676.4 | 6.0 | Be | 4708.7 | 6.3 | Pt |
| | 4677.4 | 6.0 | Be | 4708.8 | 6.2 | Gs |
| | 4678.8 | 6.1 | Wf | 4709.6 | 6.1 | Cu |
| | 4681 8 | 6.1 | Wf | 4709.6 | 6.0 | Cy |
| | 4682.8 | 6.0 | Cy | 4709.6 | 6.0 | Jn |
| | 4683.4 | 6.0 | Be | 4709.7 | 5.8 | Jo |
| | 4683.5 | 6.0 | L | 4710.7 | 6.0 | Gb |
| | 4684.7 | 6.2 | Wb | 4710.7 | 6.1 | Pt |
| | 4685.6 | 6.1 | Cy | 4710.7 | 5.9 | Pc |
| | 4686.7 | 6.0 | Pt | 4711.6 | 6.1 | Pt |
| | 4687.7 | 6.1 | Pt | 4711.8 | 6.2 | Sg |
| | 4688.4 | 6.0 | L | 4712.2 | 6.1 | Ch |
| | 4688.6 | 6.0 | Pt | 4712.4 | 6.0 | Be |
| | 4689 8 | 6.1 | Pt | 4712.6 | 6.1 | Cy |
| | 4690.4 | 6.0 | L | 4712.6 | 6.1 | Pt |
| | 4690.6 | 6.0 | Cy | 4712.7 | 6.2 | Sg |
| | 4691.6 | 5.8 | Cl | 4713.6 | 6.1 | Cl |
| | 4694.4 | 6.1 | Be | 4713.6 | 6.0 | Cm |
| | 4694.8 | 6.1 | Pt | 4713.6 | 6.2 | Pw |
| | 4694.8 | 6.0 | Wf | 4713.6 | 6.0 | Cu |
| | 4695.1 | 6.0 | Ch | 4713.6 | 6.2 | Ie |
| | 4695.4 | 6.0 | Be | 4713.7 | 6.2 | Pt |
| 154428 R CORONAE BOR.—Continued. | | | | | | |
| | 4695.4 | 6.0 | L | 4713.7 | 6.1 | Jo |
| | 4695.6 | 6.0 | Cu | 4714.6 | 6.1 | Cl |
| | 4695.6 | 6.2 | Jn | 4714.6 | 6.2 | Pw |
| | 4695.6 | 6.0 | Cu | 4714.8 | 6.2 | Pt |
| | 4695.6 | 6.1 | Ie | 4715.5 | 6.0 | L |
| | 4695.7 | 5.9 | Cy | 4716.4 | 6.0 | Be |
| | 4695.7 | 6.0 | Wf | 4716.6 | 6.1 | L |
| | 4695.7 | 6.1 | Pt | 4716.6 | 6.0 | Cy |
| | 4696.4 | 6.0 | L | 4716.6 | 6.1 | Cu |
| | 4696.6 | 5.7 | Cl | 4716.7 | 6.2 | Sg |
| | 4696.6 | 6.0 | Cu | 4716.7 | 6.6 | Gl |
| | 4696.7 | 6.1 | Pt | 4717.6 | 6.0 | L |
| | 4696.8 | 6.0 | Gb | 4717.6 | 6.1 | Pt |
| | 4697.4 | 6.0 | L | 4718.6 | 6.0 | Cy |
| | 4697.4 | 6.2 | An | 4718.6 | 6.1 | Pt |
| | 4697.7 | 5.9 | Jo | 4720.5 | 6.0 | L |
| | 4697.8 | 6.0 | Cu | 4720.6 | 6.0 | Cu |
| | 4699.7 | 6.0 | Gs | 4720.6 | 6.1 | Pt |
| | 4699.8 | 6.0 | Wf | 4720.7 | 6.6 | Gl |
| | 4700.4 | 6.1 | Be | 4720.8 | 6.2 | Sg |
| | 4700 8 | 6.1 | Wb | 4721.7 | 6.1 | Pt |
| | 4701.6 | 5.9 | Pc | 4722.6 | 6.0 | Pw |
| | 4701.6 | 6.0 | Cu | 4722.7 | 6.1 | Pt |
| | 4701.6 | 5.9 | Pc | 4723.7 | 6.0 | Sg |
| | 4702.4 | 5.9 | L | 4723.7 | 6.6 | Gl |
| | 4702.7 | 6.0 | Gb | 4725.7 | 6.1 | Pt |
| | 4702.7 | 6.1 | Pt | 4726.6 | 6.1 | Pt |
| | 4702.8 | 6.1 | Wf | 4726.6 | 6.0 | Cy |
| | 4703.6 | 6.1 | Pt | 4726.6 | 6.0 | Pc |
| | 4703.7 | 6.0 | Gs | 4727.4 | 6.1 | Be |
| | 4704 6 | 5.9 | Cy | 4727.6 | 6.1 | Pt |
| | 4704.6 | 6.2 | Pt | 4727.7 | 6.2 | Gl |
| | 4704.8 | 6.2 | Wf | 4727.8 | 6.2 | Sg |
| | 4705.7 | 6.1 | Pt | 4728.4 | 6.0 | L |
| | 4705.8 | 6.4 | Wf | 4728.7 | 5.7 | Jo |
| | 4706.6 | 6.1 | Pt | | | |
| 154536 X CORONAE BOREALIS— | | | | | | |
| | 4678.8 | 10 0 | Wf | 4700.8 | 11.7 | Wf |
| | 4695.7 | 10.6 | Pt | 4700.8 | 11.7 | Wf |
| | 4695.8 | 11.2 | Wf | 4706.7 | 12.3 | Cy |
| 154615 R SERPENTIS— | | | | | | |
| | 4558.3 | 6.4 | Ku | 4695.7 | 11.1 | Pt |
| | 4666.2 | 10.3 | Ch | 4700.8 | 11.7 | Wf |
| | 4673.1 | 10.3 | Ch | 4702.5 | 12.1 | Lp |
| | 4675.7 | 10.9 | Wf | 4704.8 | 12.1 | Wf |
| | 4678.8 | 10.9 | Wf | 4706.8 | 11.4 | Cy |
| | 4694.8 | 11.4 | Wf | | | |
| 154639 V CORONAE BOREALIS— | | | | | | |
| | 4678.8 | 9.2 | Wf | 4700.8 | 8.7 | Wf |
| | 4695.7 | 7.8 | Pt | 4705.8 | 8 7 | Wf |
| | 4695.8 | 8.9 | Wf | 4706.8 | 7.5 | Cy |
| *154715* R LIBRAE— | | | | | | |
| | 4695.7 | 11.2 | Pt | | | |
| *155018* RR LIBRAE— | | | | | | |
| | 4666.2 | 9.0 | Ch | 4695.7 | 11.0 | Pt |
| | 4673.3 | 9.1 | Ch | 4697.4 | 10.7 | L |
| | 4676.4 | 9.4 | L | 4707.4 | 10.8 | L |
| | 4676.4 | 9.2 | An | 4711.2 | 11.6 | Ch |
| | 4688.4 | 10.0 | L | 4720.4 | 11.7 | L |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| 155229 Z CORONAE BOREALIS— | | | | | | |
| | 4697.7 | 11.0 | Cu | 4713.6 | 10.4 | Cu |
| | 4706.8 | 10.6 | Cy | 4716.7 | 10.5 | Cu |
| *155823* RZ SCORPII— | | | | | | |
| | 4642.4 | 12.4 | Ht | 4693.2 | 10.8 | Ht |
| | 4648.3 | [12.2 | Sm | 4695.3 | 10.4 | En |
| | 4668.3 | [12.2 | Sm | 4695.7 | 10.2 | Pt |
| | 4682.2 | 12.0 | En | 4696.2 | 10.2 | Sm |
| | 4685.3 | 12.2 | Ht | 4696.2 | 10.6 | Ht |
| *160021* Z SCORPII— | | | | | | |
| | 4651.0 | [12.0 | Bl | 4694.4 | 11.4 | L |
| | 4668.3 | [12.2 | Sm | 4696.2 | 11.5 | Sm |
| | 4673.5 | 12.1 | L | 4707.4 | 11.9 | L |
| | 4678.3 | [12.0 | En | 4720.4 | 10.8 | L |
| | 4687.2 | [12.0 | En | | | |
| 160118 R HERCULIS— | | | | | | |
| | 4637.8 | 8.9 | Sg | 4726.7 | [10.7 | Pc |
| | 4704.6 | 13.3 | Ie | | | |
| 160210 U SERPENTIS— | | | | | | |
| | 4695.7 | 8.4 | Pt | 4712.7 | 8.9 | Cy |
| | 4696.7 | 8.8 | Cy | 4712.7 | 8.9 | Cy |
| | 4707.4 | 8.7 | Cy | 4718.6 | 8.4 | Ie |
| | 4708.7 | 8.8 | Pc | 4718.7 | 8.8 | Cy |
| *160221* X SCORPII— | | | | | | |
| | 4651.0 | 13.0 | Bl | 4682.0 | 11.4 | Bl |
| | 4667.9 | 12.2 | Bl | 4697.0 | 11.0 | Bl |
| 160325 SX HERCULIS— | | | | | | |
| | 4672.6 | 7.7 | L | 4705.7 | 8.8 | Pt |
| | 4678.8 | 8.3 | Wf | 4705.8 | 9.2 | Wf |
| | 4683.6 | 8.2 | L | 4706.6 | 8.8 | Pt |
| | 4686.6 | 8.1 | Pt | 4707.8 | 9.1 | Wf |
| | 4687.7 | 8.0 | Pt | 4708.7 | 8.9 | Pt |
| | 4688.6 | 8.0 | Pt | 4710.7 | 9.0 | Pt |
| | 4689.8 | 8.2 | Pt | 4711.6 | 9.0 | Pt |
| | 4694.8 | 8.3 | Pt | 4712.6 | 9.0 | Pt |
| | 4695.7 | 8.2 | Pt | 4713.7 | 9.2 | Pt |
| | 4695.8 | 8.5 | Wf | 4714.6 | 9.3 | L |
| | 4696.4 | 8.0 | L | 4717.6 | 9.3 | Pt |
| | 4696.7 | 8.4 | Pt | 4718.6 | 9.3 | Pt |
| | 4700.8 | 9.1 | Wf | 4720.6 | 9.2 | Pt |
| | 4702.7 | 8.7 | Pt | 4721.7 | 9.4 | Pt |
| | 4703.6 | 8.8 | Pt | 4722.7 | 9.4 | Pt |
| | 4704.6 | 8.8 | Pt | 4725.7 | 9.4 | Pt |
| | 4704.8 | 9.2 | Wf | 4726.6 | 9.5 | Pt |
| *160519* W SCORPII— | | | | | | |
| | 4667.9 | [12.0 | Bl | | | |
| 160625 RU HERCULIS— | | | | | | |
| | 4672.6 | 13.5 | L | 4700.8 | 13.5 | Wf |
| | 4678.8 | 13.2 | Wf | 4705.8 | 13.8 | Wf |
| | 4695.4 | 14.0 | L | 4707.8 | 13.7 | Wf |
| | 4695.7 | 13.4 | Pt | 4712.7 | 11.8 | Cy |
| | 4695.8 | 13.6 | Wf | 4728.4 | 14.1 | L |
| *161122a* R SCORPII— | | | | | | |
| | 4651.0 | [13.0 | Bl | 4696.2 | [12.2 | Sm |
| | 4668.0 | [13.0 | Bl | 4716.6 | [12.6 | Cu |
| *161122b* S SCORPII— | | | | | | |
| | 4651.0 | [13.0 | Bl | 4697.6 | 12.8 | Cu |
| | 4668.0 | [13.0 | Bl | 4716.6 | 11.7 | Cu |
| | 4687.3 | [12.2 | En | 4720.6 | 11.4 | Cu |
| | 4695.3 | [12.2 | En | | | |
| 161138 W CORONAE BOREALIS— | | | | | | |
| | 4678.8 | 9.9 | Wf | 4700.8 | 11.2 | Wf |
| | 4694.8 | 11.1 | Wf | 4704.8 | 11.1 | Wf |
| | 4697.7 | 11.0 | Pt | 4708.7 | 11.3 | Pc |
| *161607* W OPHIUCHI— | | | | | | |
| | 4673.4 | 14.5 | L | 4728.4 | 12.1 | Be |
| | 4695.4 | 13.2 | L | 4728.4 | 12.0 | L |
| | 4707.4 | 12.8 | L | | | |
| *162112* V OPHIUCHI— | | | | | | |
| | 4697.7 | 11.0 | Pt | | | |
| 162119 U HERCULIS— | | | | | | |
| | 4640.7 | 11.1 | Sg | 4700.8 | 8.4 | Wf |
| | 4666.1 | 9.8 | Ch | 4701.1 | 8.0 | Ch |
| | 4673.1 | 9.5 | Ch | 4701.6 | 8.3 | Cm |
| | 4678.8 | 9.4 | Wf | 4704.8 | 8.4 | Wf |
| | 4685.1 | 9.4 | Ch | 4709.7 | 8.0 | Jo |
| | 4694.8 | 8.7 | Wf | 4713.6 | 7.6 | Cm |
| | 4697.7 | 8.0 | Pt | 4718.6 | 7.4 | Jo |
| | 4697.7 | 9.0 | Jo | 4727.8 | 7.2 | Sg |
| *162319* Y SCORPII— | | | | | | |
| | 4673.4 | 11.2 | L | 4728.4 | 11.3 | L |
| | 4695.4 | 10.9 | L | | | |
| 162807 SS HERCULIS— | | | | | | |
| | 4673.4 | 12.6 | L | 4697.7 | 9.8 | Pt |
| | 4683.6 | 11.9 | L | 4712.7 | 8.8 | Cy |
| | 4694.4 | 10.3 | L | 4715.5 | 9.1 | L |
| *162815* T OPHIUCHI— | | | | | | |
| | 4651.0 | 10.6 | Bl | 4695.4 | 11.9 | L |
| | 4668.0 | 11.3 | Bl | 4707.5 | 12.5 | L |
| | 4677.4 | 11.8 | L | 4728.4 | 12.9 | L |
| | 4682.0 | 11.8 | Bl | | | |
| *162816* S OPHIUCHI— | | | | | | |
| | 4651.1 | [13.2 | Bl | 4707.5 | 13.2 | L |
| | 4673.4 | 14.5 | L | 4728.4 | 10.3 | L |
| | 4675.4 | 13.7 | L | | | |
| 163137 W HERCULIS— | | | | | | |
| | 4666.1 | 10.8 | Ch | 4697.7 | 12.0 | Pt |
| | 4674.1 | 11.2 | Ch | 4701.1 | 11.5 | Ch |
| 163172 R URSAE MINORIS— | | | | | | |
| | 4706.5 | 10.1 | Lp | | | |
| 163266 R DRACONIS— | | | | | | |
| | 4666.1 | 9.5 | Ch | 4701.8 | 9.9 | Jo |
| | 4671.8 | 9.9 | Wf | 4702.6 | 10.8 | Lp |
| | 4694.8 | 10.3 | Wf | 4704.8 | 10.9 | Wf |
| | 4697.7 | 11.0 | Pt | 4706.2 | 10.9 | Ch |
| | 4700.8 | 10.9 | Wf | 4709.8 | 9.9 | Jo |
| *164319* RR OPHIUCHI— | | | | | | |
| | 4673.4 | 11.8 | L | 4697.7 | 11.9 | Pt |
| | 4678.3 | [12.0 | En | 4702.5 | 11.2 | L |
| | 4688.4 | 12.0 | L | 4710.7 | 10.6 | Pc |
| | 4696.2 | 11.7 | Sm | 4716.5 | 10.1 | L |
| | 4696.3 | 11.6 | En | | | |
| 164715 S HERCULIS— | | | | | | |
| | 4671.8 | 9.4 | Wf | 4700.8 | 10.0 | Wf |
| | 4673.2 | 9.5 | Ch | 4704.8 | 10.1 | Wf |
| | 4694.8 | 10.0 | Wf | 4709.7 | 10.4 | Jo |
| | 4697.7 | 9.8 | Pt | 4712.2 | 10.6 | Ch |
| | 4697.7 | 9.9 | Jo | | | |
| *164844* RS SCORPII— | | | | | | |
| | 4643.3 | 10.4 | En | 4668.3 | 11.0 | En |
| | 4647.3 | 10.4 | En | 4671.3 | 11.4 | Ht |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| *164844* RS SCORPII—Continued. | | | | | | |
| | 4648.3 | 9.8 | Sm | 4675.3 | 11.0 | En |
| | 4651.1 | 10.4 | Bl | 4682.0 | 11.3 | Bl |
| | 4651.3 | 10.4 | En | 4682.3 | 11.7 | En |
| | 4652.2 | 10.4 | Sm | 4685.3 | 11.7 | Ht |
| | 4660.3 | 10.9 | Sm | 4696.2 | 12.0 | En |
| | 4664.0 | 10.5 | Bl | 4696.3 | 11.7 | Ht |
| | 4668.3 | 10.6 | En | 4696.3 | 11.2 | Sm |
| | 4668.3 | 11.2 | Sm | 4697.0 | 11.7 | Bl |
| *165030* RR SCORPII— | | | | | | |
| | 4651.1 | 11.4 | Bl | 4682.0 | 9.5 | Bl |
| | 4664.0 | 9.9 | Bl | | | |
| *165202* SS OPHIUCHI— | | | | | | |
| | 4697.7 | 8.8 | Pt | | | |
| 165631 RV HERCULIS— | | | | | | |
| | 4640.7 | 11.3 | Sg | 4708.7 | [13.8 | Lv |
| | 4694.7 | [13.7 | Lv | 4727.8 | 11.8 | Sg |
| | 4697.7 | 14.0 | Pt | | | |
| *165636* RT SCORPII— | | | | | | |
| | 4651.1 | [13.0 | Bl | 4668.0 | [13.0 | Bl |
| *170215* R OPHIUCHI— | | | | | | |
| | 4666.2 | 10.6 | Ch | 4701.6 | 11.8 | Ie |
| | 4672.6 | 10.3 | Mm | 4703.6 | 11.1 | Mm |
| | 4674.1 | 11.1 | Ch | 4710.7 | [11.0 | Wb |
| | 4697.7 | 11.2 | Pt | | | |
| 170627 RT HERCULIS— | | | | | | |
| | 4678.8 | 14.8 | Wf | 4705.8 | 15.0 | Wf |
| | 4695.7 | 15.0 | Wf | 4713.6 | [12.3 | Cl |
| | 4700.8 | 15.0 | Wf | | | |
| *170833* RW SCORPII— | | | | | | |
| | 4651.1 | 12.0 | Bl | 4682.0 | 9.2 | Bl |
| | 4664.0 | 9.8 | Bl | | | |
| 171401 Z OPHIUCHI— | | | | | | |
| | 4697.7 | 13.2 | Pt | 4714.6 | 11.9 | Cl |
| | 4708.7 | 11.2 | Pc | | | |
| 171723 RS HERCULIS— | | | | | | |
| | 4678.8 | 9.7 | Wf | 4700.8 | 8.5 | Wf |
| | 4695.8 | 8.9 | Wf | 4705.8 | 8.3 | Wf |
| | 4697.7 | 8.7 | Pt | | | |
| *172486* S OCTANTIS— | | | | | | |
| | 4648.3 | 10.3 | Sm | 4671.2 | 9.1 | Ht |
| | 4651.1 | 10.4 | Bl | 4682.0 | 8.2 | Bl |
| | 4653.2 | 10.0 | Sm | 4685.2 | 8.6 | Ht |
| | 4660.3 | 9.7 | Sm | 4696.2 | 8.6 | Ht |
| | 4664.0 | 9.0 | Bl | 4697.0 | 8.9 | Bl |
| | 4668.3 | 9.1 | Sm | 4697.3 | 8.8 | Sm |
| 172809 RU OPHIUCHI— | | | | | | |
| | 4697.7 | 11.2 | Pt | 4713.6 | [11.6 | Pw |
| *173542* RU SCORPII— | | | | | | |
| | 4651.1 | 11.7 | Bl | 4682.0 | 11.4 | Bl |
| | 4664.0 | 11.6 | Bl | 4697.0 | 11.5 | Bl |
| *174135* SV SCORPII— | | | | | | |
| | 4651.1 | [12.5 | Bl | 4682.0 | 11.3 | Bl |
| *174162* W PAVONIS— | | | | | | |
| | 4642.4 | [12.3 | Ht | 4676.3 | [12.1 | En |
| | 4651.1 | [13.0 | Bl | 4685.3 | [12.3 | Ht |
| | 4668.0 | [13.0 | Bl | 4696.3 | [12.3 | Ht |
| 174406 RS OPHIUCHI— | | | | | | |
| | 4697.7 | 11.2 | Pt | | | |
| *174551* U ARAE— | | | | | | |
| | 4640.3 | [12.3 | Sm | 4688.3 | [11.9 | En |
| | 4648.3 | 12.3 | Sm | 4696.2 | 11.0 | En |
| | 4669.2 | [13.0 | Sm | 4696.2 | 12.3 | Sm |
| | 4678.3 | [12.3 | En | | | |
| 175458a T DRACONIS— | | | | | | |
| | 4694.8 | 12.3 | Wf | 4704.8 | 12.6 | Wf |
| | 4700.8 | 12.5 | Wf | | | |
| 175458b UY DRACONIS— | | | | | | |
| | 4694.8 | 11.1 | Wf | 4704.8 | 11.2 | Wf |
| | 4700.8 | 10.9 | Wf | | | |
| 175519 RY HERCULIS— | | | | | | |
| | 4666.2 | 10.0 | Ch | 4696.8 | 12.8 | Lv |
| | 4671.2 | 10.1 | Ch | 4697.7 | 12.3 | Pt |
| | 4684.8 | 11.5 | Lv | 4704.6 | 13.5 | Ie |
| | 4689.8 | 12.0 | Lv | 4715.7 | 13.5 | Lv |
| | 4692.8 | 12.8 | Lv | 4723.7 | [13.3 | Lv |
| | 4695.8 | 12.9 | Bi | | | |
| 175654 V DRACONIS— | | | | | | |
| | 4697.7 | 9.6 | Pt | 4709.6 | 9.3 | Ie |
| *180363* R PAVONIS— | | | | | | |
| | 4640.3 | [11.9 | Sm | 4685.3 | [11.9 | Ht |
| | 4648.4 | [11.9 | Sm | 4696.2 | 12.4 | Sm |
| | 4668.3 | [11.9 | Sm | 4696.3 | 12.2 | Ht |
| | 4671.3 | [11.9 | Ht | 4696.3 | 11.8 | En |
| | 4682.3 | [11.8 | En | | | |
| 180531 T HERCULIS— | | | | | | |
| | 4666.2 | 8.2 | Ch | 4701.1 | 9.0 | Ch |
| | 4677.4 | 7.6 | L | 4701.6 | 8.7 | Cm |
| | 4678.8 | 7.6 | Wf | 4702.5 | 8.4 | Lp |
| | 4690.4 | 7.6 | L | 4704.8 | 8.4 | Wf |
| | 4692.5 | 8.1 | Lp | 4706.4 | 9.2 | Lp |
| | 4694.8 | 8.2 | Wf | 4713.6 | 9.1 | Cm |
| | 4697.7 | 8.3 | Pt | 4714.6 | 8.7 | L |
| | 4700.4 | 8.3 | L | 4716.8 | 9.0 | Jo |
| | 4700.8 | 8.4 | Wf | 4718.6 | 9.2 | Ie |
| 180565 W DRACONIS— | | | | | | |
| | 4696.8 | [13.0 | Lv | | | |
| 180666 X DRACONIS— | | | | | | |
| | 4695.7 | [13.0 | Lv | | | |
| 180911 NOVA OPHIUCHI— | | | | | | |
| | 4697.7 | [12.2 | Pt | | | |
| 181031 TV HERCULIS— | | | | | | |
| | 4673.4 | 13.4 | L | 4717.6 | [14.0 | L |
| | 4707.5 | 14.1 | L | | | |
| 181103 RY OPHIUCHI— | | | | | | |
| | 4678.8 | 13.8 | Wf | 4699.8 | 13.0 | Wf |
| | 4682.7 | 14.0 | Wf | 4697.7 | 13.2 | Pt |
| | 4684.8 | 13.7 | Lv | 4703.8 | 12.6 | Wf |
| | 4689.8 | 13.6 | Lv | 4706.7 | 12.4 | Wf |
| | 4694.7 | 13.7 | Wf | 4708.7 | 12.0 | Lv |
| | 4695.8 | 13.7 | Bi | 4713.7 | 11.8 | Lv |
| | 4696.8 | 13.5 | Lv | 4723.7 | 10.3 | Lv |
| 181136 W LYRAE— | | | | | | |
| | 4676.4 | 10.6 | L | 4699.8 | 12.0 | Wf |
| | 4676.4 | 10.4 | An | 4700.8 | 12.0 | Wf |
| | 4678.8 | 10.6 | Wf | 4701.4 | 12.1 | L |
| | 4679.7 | 10.6 | Wf | 4702.8 | 11.8 | Wf |
| | 4681.7 | 11.1 | Wf | 4704.8 | 12.1 | Wf |
| | 4690.4 | 11.4 | L | 4705.8 | 12.1 | Wf |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| 181136 W LYRAE—Continued. | | | | | | |
| | 4694.8 | 11.7 | Wf | 4706.7 | 12.0 | Wf |
| | 4695.8 | 11.8 | Wf | 4707.8 | 12.1 | Wf |
| | 4697.7 | 12.0 | Pt | 4715.5 | 12.3 | L |
| *182133* RV SAGITTARII— | | | | | | |
| | 4651.1 | [13.6 | Bl | 4668.0 | [13.6 | Bl |
| 182224 SV HERCULIS— | | | | | | |
| | 4676.4 | 12.0 | L | 4697.7 | 12.6 | Pt |
| | 4676.4 | 11.6 | An | 4702.4 | 12.9 | L |
| | 4690.4 | 12.5 | L | 4717.6 | 13.8 | L |
| 182306 T SERPENTIS— | | | | | | |
| | 4705.6 | [10.8 | Pw | 4713.7 | [11.5 | Pw |
| 183308 X OPHIUCHI— | | | | | | |
| | 4672.6 | 9.0 | Mm | 4704.7 | 8.4 | Cy |
| | 4673.4 | 8.6 | L | 4706.7 | 8.5 | Wb |
| | 4676.4 | 9.0 | An | 4708.7 | 8.9 | Cy |
| | 4690.4 | 8.6 | L | 4709.7 | 8.3 | Jo |
| | 4696.7 | 8.5 | Wb | 4712.6 | 8.7 | Cy |
| | 4696.7 | 8.4 | Cy | 4713.7 | 8.2 | Jo |
| | 4697.7 | 8.5 | Pt | 4714.6 | 7.7 | L |
| | 4697.7 | 8.4 | Jo | 4718.6 | 8.6 | Cy |
| | 4702.4 | 8.4 | L | 4718.7 | 8.3 | Jo |
| | 4703.6 | 8.5 | Mm | 4726.7 | 8.0 | Cy |
| 184134 RV LYRAE— | | | | | | |
| | 4705.6 | [11.2 | Pw | 4713.7 | [11.7 | Pw |
| *184205* R SCUTI— | | | | | | |
| | 4670.2 | 5.7 | Ch | 4707.4 | 5.7 | Be |
| | 4672.6 | 5.0 | L | 4707.8 | 5.7 | Pt |
| | 4676.4 | 5.2 | An | 4708.5 | 6.0 | Ro |
| | 4676.7 | 5.3 | Mm | 4708.7 | 5.7 | Pt |
| | 4677.4 | 5.4 | An | 4708.7 | 5.7 | Cy |
| | 4680.7 | 5.3 | Cy | 4709.6 | 5.8 | Cy |
| | 4682.8 | 5.3 | Cy | 4709.7 | 5.0 | Jo |
| | 4683.6 | 5.0 | L | 4710.7 | 6.0 | Pt |
| | 4685.6 | 5.2 | Cy | 4711.5 | 6.0 | Ro |
| | 4686.7 | 5.1 | Pt | 4711.6 | 5.8 | Pt |
| | 4687.7 | 5.1 | Pt | 4712.4 | 5.9 | Be |
| | 4689.6 | 5.1 | Pt | 4712.6 | 6.0 | L |
| | 4690.4 | 5.0 | L | 4712.6 | 6.0 | Cy |
| | 4694.8 | 5.0 | Pt | 4712.6 | 5.9 | Pt |
| | 4695.6 | 5.5 | Ie | 4713.6 | 5.8 | Ie |
| | 4695.7 | 5.4 | Pt | 4713.6 | 6.1 | Cu |
| | 4695.7 | 5.6 | Cy | 4713.6 | 5.8 | Pc |
| | 4696.6 | 5.2 | Cu | 4713.7 | 5.1 | Jo |
| | 4696.7 | 5.7 | Cy | 4713.7 | 5.9 | Pt |
| | 4696.8 | 5.8 | Gb | 4714.8 | 6.0 | Pt |
| | 4697.4 | 5.4 | An | 4716.6 | 6.0 | Cu |
| | 4697.7 | 5.7 | Pt | 4716.7 | 6.1 | Cy |
| | 4697.8 | 4.8 | Jo | 4717.6 | 6.0 | Pt |
| | 4697.8 | 5.3 | Cu | 4718.6 | 6.2 | Jo |
| | 4700.4 | 5.3 | An | 4718.6 | 6.2 | Cy |
| | 4700.4 | 5.2 | Be | 4718.6 | 5.8 | Ie |
| | 4700.4 | 5.2 | L | 4718.6 | 6.1 | Pt |
| | 4701.6 | 5.7 | Pc | 4720.6 | 6.3 | Pt |
| | 4701.6 | 5.9 | Cm | 4721.7 | 6.5 | Pt |
| | 4702.7 | 6.1 | Gb | 4722.7 | 6.4 | Pt |
| | 4702.7 | 5.5 | Pt | 4724.6 | 6.6 | Ie |
| | 4703.6 | 5.8 | Mm | 4725.7 | 6.5 | Pt |
| | 4703.6 | 5.6 | Pt | 4726.6 | 6.4 | Pt |
| | 4704.6 | 5.8 | Pt | 4726.6 | 7.0 | Cy |
| | 4704.7 | 5.7 | Cy | 4726.6 | 6.5 | Pc |
| *184205* R SCUTI—Continued. | | | | | | |
| | 4705.7 | 5.8 | Pt | 4727.3 | 6.6 | An |
| | 4706.6 | 5.8 | Pt | 4727.4 | 6.4 | Be |
| | 4706.7 | 5.8 | Cy | 4727.6 | 6.5 | Pt |
| | 4707.1 | 6.0 | Ch | 4728.4 | 6.6 | Be |
| | 4707.4 | 6.0 | An | | | |
| 184300 NOVA AQUILAE, 1918— | | | | | | |
| | 4671.2 | 10.5 | Ch | 4708.7 | 11.0 | Pt |
| | 4686.7 | 11.0 | Pt | 4710.7 | 11.0 | Pt |
| | 4695.7 | 11.2 | Pt | 4711.3 | 10.9 | Ro |
| | 4697.7 | 11.2 | Pt | 4713.6 | 10.4 | Ie |
| | 4702.7 | 11.2 | Pt | 4714.6 | 10.3 | Cl |
| | 4704.6 | 11.0 | Pt | 4717.6 | 11.0 | Pt |
| | 4707.1 | 10.4 | Ch | 4724.6 | 10.6 | Ie |
| | 4708.3 | 10.9 | Ro | 4726.6 | 11.0 | Pt |
| 185032 RX LYRAE— | | | | | | |
| | 4671.2 | [11.9 | Ch | 4706.1 | [12.5 | Ch |
| | 4701.1 | [11.3 | Ch | | | |
| *185437a* S CORONAE AUSTRALIS— | | | | | | |
| | 4651.1 | 12.0 | Bl | 4682.0 | 11.9 | Bl |
| | 4668.0 | 12.1 | Bl | | | |
| *185512a* ST SAGITTARII— | | | | | | |
| | 4671.2 | 9.0 | Ch | 4700.4 | 11.2 | L |
| | 4678.6 | 9.3 | L | 4706.1 | 11.2 | Ch |
| | 4690.4 | 10.3 | L | 4716.7 | 11.7 | Cu |
| | 4697.7 | 10.7 | Cu | 4717.6 | 12.2 | L |
| *185537a* R CORONAE AUSTRALIS— | | | | | | |
| | 4651.1 | 12.8 | Bl | 4682.0 | 12.5 | Bl |
| | 4668.0 | 12.1 | Bl | | | |
| *185537b* T CORONAE AUSTRALIS— | | | | | | |
| | 4651.1 | [13.0 | Bl | 4668.0 | [12.5 | Bl |
| 185737 RT LYRAE— | | | | | | |
| | 4671.2 | [11.1 | Ch | 4706.1 | 11.4 | Ch |
| | 4701.1 | 11.6 | Ch | | | |
| *185905* V AQUILAE— | | | | | | |
| | 4671.2 | 7.3 | Ch | | | |
| 190108 R AQUILAE— | | | | | | |
| | 4670.2 | 11.5 | Ch | 4702.5 | 10.4 | Lp |
| | 4692.8 | 10.3 | Wf | 4704.8 | 10.6 | Wf |
| | 4697.7 | 10.7 | Pt | 4706.4 | 9.5 | Lp |
| | 4700.8 | 10.7 | Wf | 4707.1 | 10.9 | Ch |
| 190529a V LYRAE— | | | | | | |
| | 4697.7 | 9.8 | Pt | | | |
| *190818* RX SAGITTARII— | | | | | | |
| | 4670.2 | [10.8 | Ch | 4710.2 | [10.8 | Ch |
| *190819a* RW SAGITTARII— | | | | | | |
| | 4670.2 | 10.4 | Ch | 4710.2 | 9.7 | Ch |
| | 4697.7 | 9.6 | Pt | | | |
| *190907* TY AQUILAE— | | | | | | |
| | 4697.7 | 10.3 | Pt | | | |
| 190925 S LYRAE— | | | | | | |
| | 4689.8 | 14.0 | Lv | 4713.8 | [14.0 | Bi |
| | 4701.1 | [11.6 | Ch | 4725.7 | [13.1 | Lv |
| 190926 X LYRAE— | | | | | | |
| | 4696.7 | 9.0 | Pt | | | |
| 190933a RS LYRAE— | | | | | | |
| | 4689.8 | [13.4 | Lv | 4713.8 | [14.0 | Bi |
| | 4701.1 | [11.8 | Ch | 4725.7 | [13.5 | Lv |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| 190967 U DRACONIS— | | | | | | |
| | 4670.2 | 9.9 | Ch | 4709.6 | 11.2 | Ie |
| | 4696.7 | 10.1 | Pt | 4710.2 | 11.8 | Ch |
| *191007* W AQUILAE— | | | | | | |
| | 4710.2 | [11.8 | Ch | | | |
| *191017* T SAGITTARII— | | | | | | |
| | 4696.7 | 11.2 | Pt | 4710.7 | 11.3 | Pc |
| | 4710.2 | 11.4 | Ch | | | |
| *191019* R SAGITTARII— | | | | | | |
| | 4696.7 | 12.5 | Pt | 4710.7 | [11.2 | Pc |
| *191033* RY SAGITTARII— | | | | | | |
| | 4642.4 | 7.1 | Ht | 4695.7 | 6.3 | Pt |
| | 4648.4 | 7.1 | Sm | 4696.2 | 7.0 | Sm |
| | 4648.4 | 7.3 | Bl | 4696.3 | 6.9 | Ht |
| | 4651.1 | 7.1 | Bl | 4696.3 | 7.0 | En |
| | 4655.0 | 7.1 | Bl | 4697.0 | 6.5 | Bl |
| | 4656.4 | 7.4 | Ht | 4697.5 | 6.1 | L |
| | 4660.3 | 7.0 | Sm | 4697.7 | 6.3 | Pt |
| | 4664.0 | 6.3 | Bl | 4697.7 | 7.0 | Cu |
| | 4667.4 | 6.9 | Ht | 4702 5 | 6.4 | L |
| | 4668.0 | 6.5 | Bl | 4703.6 | 6.5 | Pt |
| | 4668.3 | 7.0 | Sm | 4705.7 | 6.4 | Pt |
| | 4670.2 | 6.5 | Ch | 4708.7 | 6.4 | Pt |
| | 4671.3 | 6.3 | En | 4710.2 | 7.0 | Ch |
| | 4671.4 | 6.5 | Ht | 4710.7 | 6.5 | Pt |
| | 4672.5 | 5.8 | L | 4711.7 | 6.5 | Pt |
| | 4682.0 | 6.6 | Bl | 4712.6 | 6.3 | Pt |
| | 4683.5 | 6.5 | L | 4713.7 | 6.3 | Pt |
| | 4685.3 | 6.5 | Ht | 4717.6 | 6.3 | Pt |
| | 4686.7 | 6.6 | Pt | 4722.7 | 6.3 | Pt |
| | 4687.7 | 6.5 | Pt | 4726.6 | 6.4 | Pt |
| | 4692.6 | 6.2 | L | 4727.6 | 6.5 | Pt |
| | 4694.8 | 6.4 | Pt | 4728.4 | 6.3 | L |
| *191124* TY SAGITTARII— | | | | | | |
| | 4651.1 | [12.4 | Bl | 4682.0 | [12.4 | Bl |
| *191319* S SAGITTARII— | | | | | | |
| | 4682.0 | [12.7 | Bl | | | |
| *191331* SW SAGITTARII— | | | | | | |
| | 4682.0 | 12.3 | Bl | | | |
| 191350 TZ CYGNI— | | | | | | |
| | 4697.7 | 10.1 | Pt | 4726.6 | 10.1 | Pt |
| 191637 U LYRAE— | | | | | | |
| | 4697.7 | 10.8 | Pt | 4726.6 | 10.6 | Pt |
| 192745 AF CYGNI— | | | | | | |
| | 4596.4 | 7.5 | Vv | 4650.4 | 6.5 | Vv |
| | 4615.5 | 7.8 | Vv | 4651.4 | 6.6 | Pg |
| | 4616.4 | 7.8 | Vv | 4654.4 | 6.3 | Vv |
| | 4616.5 | 7.4 | Pg | 4654.5 | 6.6 | Pg |
| | 4618.5 | 7.7 | Vv | 4655.4 | 6.3 | Vv |
| | 4620.3 | 7.7 | Vv | 4656.4 | 6.3 | Vv |
| | 4621.4 | 7.7 | Vv | 4657.4 | 6.4 | Vv |
| | 4632.4 | 7.5 | Vv | 4658.4 | 6.3 | Vv |
| | 4639.4 | 6.5 | Vv | 4660.4 | 6.5 | Vv |
| | 4641.4 | 6.5 | Vv | 4661.4 | 6.3 | Vv |
| | 4641.5 | 6.7 | Pg | 4670.4 | 6.8 | Vv |
| 192928 TY CYGNI— | | | | | | |
| | 4670.2 | [11.2 | Ch | 4726.6 | 10.4 | Pt |
| | 4706.1 | [11.2 | Ch | | | |
| 193311 RT AQUILAE— | | | | | | |
| | 4697.7 | 13.2 | Pt | 4726.6 | 13.8 | Pt |
| | 4707.1 | [11.7 | Ch | | | |
| 193449 R CYGNI— | | | | | | |
| | 4678.8 | 13.0 | Wf | 4699.8 | 13.3 | Wf |
| | 4694.8 | 13.2 | Wf | 4704.8 | 13.4 | Wf |
| | 4695.8 | [12.8 | Cy | 4712.7 | [12.4 | Sg |
| | 4696.9 | 13 4 | Lv | 4726.6 | 13.6 | Pt |
| | 4697.7 | 13.8 | Pt | | | |
| 193509 RV AQUILAE— | | | | | | |
| | 4697.7 | 9.8 | Pt | 4726.6 | 10.6 | Pt |
| *193972* T PAVONIS— | | | | | | |
| | 4642.4 | [12.1 | Ht | 4682.0 | [13.2 | Bl |
| | 4648.3 | [13.2 | Sm | 4685.3 | [12.1 | Ht |
| | 4668.3 | [13.2 | Sm | 4696.2 | 13.2 | Sm |
| | 4671.3 | [12.1 | Ht | | | |
| 194048 RT CYGNI— | | | | | | |
| | 4668.2 | 9.1 | Ch | 4703.7 | 10.0 | Mm |
| | 4671.3 | 9.3 | Ch | 4706.1 | 11.6 | Ch |
| | 4671.7 | 9.7 | Mm | 4707.7 | 11.2 | Bi |
| | 4679.2 | 9.9 | Ch | 4710.6 | [11.7 | Pc |
| | 4688.7 | 9.9 | Jo | 4712.7 | [11.7 | Sg |
| | 4695.7 | 10.9 | Cy | 4716.7 | 12.1 | Cy |
| | 4696.9 | 11.4 | Lv | 4726.6 | 12.4 | Pt |
| | 4697.7 | 11.2 | Pt | | | |
| 194348 TU CYGNI— | | | | | | |
| | 4696.9 | 13.2 | Lv | 4711.2 | [11.2 | Ch |
| 194604 X AQUILAE— | | | | | | |
| | 4681.7 | [13.8 | Wf | 4700.8 | 15.0 | Wf |
| | 4689.9 | [13.8 | Lv | 4705.8 | 15.3 | Wf |
| | 4695.7 | 15.0 | Wf | 4713.8 | [14.0 | Bi |
| 194632 χ CYGNI— | | | | | | |
| | 4503.1 | 6.4 | Ku | 4694.8 | 11.0 | Wf |
| | 4506.1 | 6.2 | Ku | 4695.4 | 11.1 | L |
| | 4610.2 | 6.4 | Ku | 4695.4 | 11.2 | An |
| | 4527.1 | 5.6 | Ku | 4697.7 | 10.8 | Pt |
| | 4528.1 | 5.5 | Ku | 4699.3 | 10.9 | Ch |
| | 4546.1 | 4.6 | Ku | 4699.8 | 10.9 | Wf |
| | 4547.1 | 4.5 | Ku | 4704.8 | 11.3 | Wf |
| | 4553.1 | 4.5 | Ku | 4705.6 | 10.7 | Pw |
| | 4554.1 | 4.5 | Ku | 4706.5 | 11.4 | Lp |
| | 4556.1 | 4.5 | Ku | 4707.4 | 11.3 | L |
| | 4557.2 | 4.6 | Ku | 4709.1 | 11.5 | Ch |
| | 4558.1 | 4.6 | Ku | 4709.6 | 11.1 | Cl |
| | 4571.6 | 5 3 | Ku | 4712.6 | 11.5 | Pt |
| | 4670.2 | 9.4 | Ch | 4717.6 | 11.3 | L |
| | 4678.8 | 9.9 | Wf | 4724.4 | 11.6 | Lp |
| | 4679.2 | 10.2 | Ch | 4726.6 | 12.3 | Pt |
| | 4692.5 | 10.9 | Lp | | | |
| *194929* RR SAGITTARII— | | | | | | |
| | 4682.0 | 9.6 | Bl | | | |
| *195142* RU SAGITTARII— | | | | | | |
| | 4642.4 | 7.0 | Ht | 4671.4 | 7.9 | Ht |
| | 4648.4 | 7.6 | Sm | 4678.3 | 8.4 | En |
| | 4648.4 | 7.3 | Ht | 4682.0 | 9.0 | Bl |
| | 4656.4 | 7.5 | Ht | 4685.3 | 9.4 | Ht |
| | 4660.3 | 7.6 | Sm | 4696.3 | 10.0 | Sm |
| | 4667.4 | 7.6 | Ht | 4696.3 | 10.5 | Ht |
| | 4668.3 | 7.9 | Sm | 4696.3 | 10.5 | En |
| 195553 NOVA CYGNI, 1920— | | | | | | |
| | 4686.7 | [12.2 | Pt | 4702.7 | 13.0 | Pt |
| | 4695.7 | 12.7 | Pt | 4710.7 | 12.7 | Pt |
| | 4697.7 | 12.6 | Pt | | | |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| 195849 Z CYGNI— | | | | | | |
| | 4692.8 | 13.3 | Wf | 4705.8 | 12.6 | Wf |
| | 4697.7 | 12.2 | Pt | 4712.6 | 11.3 | Pt |
| | 4700.8 | 13.0 | Wf | 4726.6 | 10.3 | Pt |
| *195855* S TELESCOPII— | | | | | | |
| | 4682.0 | 13.0 | Bl | | | |
| 200212 SV AQUILAE— | | | | | | |
| | 4695.4 | 12.3 | L | 4712.6 | 14.0 | L |
| | 4697.7 | 13.0 | Pt | 4726.7 | 12.5 | Pt |
| 200357 S CYGNI— | | | | | | |
| | 4678.8 | 12.7 | Wf | 4706.8 | 11.3 | Pw |
| | 4694.8 | 12.0 | Wf | 4706.8 | 11.3 | Pw |
| | 4696.9 | 11.7 | Lv | 4707.7 | 10.9 | Bi |
| | 4699.8 | 11.5 | Wf | 4712.6 | 11.4 | Pt |
| | 4702.7 | 11.4 | Pt | 4712.7 | 11.4 | Sg |
| | 4704.8 | 11.5 | Wf | 4724.4 | 11.3 | Lp |
| | 4705.6 | 11.1 | Pw | 4726.7 | 11.0 | Pc |
| | 4706.5 | 11.4 | Lp | 4726.7 | 10.5 | Pt |
| *200514* R CAPRICORNI— | | | | | | |
| | 4689.9 | 12.6 | Lv | 4713.8 | 13.2 | Bi |
| | 4695.8 | [12.5 | Sm | | | |
| 200715a S AQUILAE— | | | | | | |
| | 4671.3 | 9.6 | Ch | 4702.7 | 10.1 | Pt |
| | 4681.7 | 9.8 | Wf | 4704.8 | 10.8 | Wf |
| | 4694.8 | 10.2 | Wf | 4712.7 | 10.1 | Pt |
| | 4699.2 | 10.4 | Ch | 4714.6 | 9.6 | Cl |
| | 4699.8 | 10.6 | Wf | 4724.4 | 10.6 | Lp |
| | 4702.5 | 10.5 | Lp | 4726.7 | 10.2 | Pt |
| 200715b RW AQUILAE— | | | | | | |
| | 4702.7 | 9.3 | Pt | 4714.7 | 9.3 | Cl |
| | 4712.7 | 9.3 | Pt | 4726.7 | 9.2 | Pt |
| *200747* R TELESCOPII— | | | | | | |
| | 4682.0 | 9.6 | Bl | | | |
| 200812 RU AQUILAE— | | | | | | |
| | 4689.9 | [12.7 | Lv | 4713.8 | 13.8 | Bi |
| | 4706.8 | [11.6 | Pw | | | |
| *200822* W CAPRICORNI— | | | | | | |
| | 4702.7 | 11.9 | Pt | 4726.7 | 11.0 | Pt |
| *200906* Z AQUILAE— | | | | | | |
| | 4702.7 | 9.5 | Pt | 4712.6 | 9.8 | Pt |
| | 4706.8 | 9.5 | Pw | 4726.7 | 10.2 | Pt |
| 200916 R SAGITTAE— | | | | | | |
| | 4697.7 | 8.6 | Cu | 4716.7 | 9.1 | Cu |
| | 4714.6 | 9.1 | Cu | | | |
| 200938 RS CYGNI— | | | | | | |
| | 4668.2 | 8.2 | Ch | 4703.7 | 7.5 | Mm |
| | 4670.2 | 7.8 | Ch | 4704.7 | 7.2 | Cy |
| | 4672.6 | 7.3 | L | 4706.1 | 7.1 | Ch |
| | 4673.3 | 7.4 | Ch | 4707.1 | 7.2 | Ch |
| | 4674.2 | 7.4 | Ch | 4708.7 | 7.2 | Cy |
| | 4676.7 | 7.5 | Mm | 4709.1 | 7.2 | Ch |
| | 4679.2 | 7.8 | Ch | 4711.8 | 7.3 | Sg |
| | 4683.6 | 7.4 | L | 4712.6 | 7.3 | Cy |
| | 4685.2 | 7.8 | Ch | 4712.7 | 7.1 | Pt |
| | 4688.7 | 7.3 | Jo | 4713.6 | 7.2 | Jo |
| | 4690.6 | 7.2 | Cy | 4714.6 | 7.0 | L |
| | 4694.4 | 7.3 | L | 4716.6 | 7.0 | Cy |
| | 4696.8 | 7.4 | Gb | 4717.1 | 7.2 | Ch |
| | 4697.7 | 7.3 | Cy | 4718.6 | 7.0 | Cy |
| | 4699.2 | 7.2 | Ch | 4718.7 | 8.2 | Jo |
| | 4701.7 | 7.1 | Jo | 4723.7 | 7.2 | Sg |
| 200938 RS CYGNI—Continued. | | | | | | |
| | 4702.4 | 7.4 | An | 4726.7 | 7.0 | Cy |
| | 4702.4 | 7.3 | L | 4726.7 | 7.1 | Pt |
| | 4702.7 | 7.4 | Pt | | | |
| 201008 R DELPHINI— | | | | | | |
| | 4673.3 | 8.5 | Ch | 4712.6 | 10.1 | Pt |
| | 4690.4 | 8.8 | L | 4715.5 | 10.0 | L |
| | 4699.2 | 9.5 | Ch | 4724.6 | 10.6 | Ie |
| | 4701.5 | 9.5 | L | 4726.7 | 10.8 | Pt |
| | 4702.7 | 9.5 | Pt | | | |
| *201121* RT CAPRICORNI— | | | | | | |
| | 4704.8 | 7.0 | Pt | | | |
| 201130 SX CYGNI— | | | | | | |
| | 4692.7 | 12.8 | Cy | 4708.7 | 12.3 | Cy |
| | 4702.7 | 13.6 | Pt | 4726.7 | 11.5 | Pt |
| *201139* RT SAGITTARII— | | | | | | |
| | 4682.0 | 7.6 | Bl | | | |
| 201437b WX CYGNI— | | | | | | |
| | 4696.7 | 12.2 | Cy | 4709.7 | 12.3 | Ie |
| | 4702.7 | 12.5 | Pt | 4711.8 | 12.3 | Sg |
| | 4704.7 | 12.2 | Cy | 4712.6 | 12.2 | Cy |
| | 4707.8 | 11.4 | Bi | 4726.7 | 12.1 | Pt |
| | 4708.7 | 12.2 | Cy | | | |
| 201647 U CYGNI— | | | | | | |
| | 4670.2 | 10.2 | Ch | 4708.3 | 9.8 | Ro |
| | 4681.7 | 10.0 | Wf | 4710.7 | 10.2 | Gb |
| | 4688.6 | 9.1 | Jo | 4711.3 | 9.8 | Ro |
| | 4694.9 | 10.0 | Wf | 4712.6 | 9.0 | Pt |
| | 4700.8 | 10.6 | Wf | 4712.7 | 9.7 | Sg |
| | 4701.7 | 9.2 | Io | 4713.7 | 9.8 | Jo |
| | 4702.7 | 9.0 | Pt | 4717.2 | 10.5 | Ch |
| | 4704.8 | 10.6 | Wf | 4726.7 | 10.1 | Pt |
| | 4707.8 | 8.4 | Bi | | | |
| *202240* U MICROSCOPII— | | | | | | |
| | 4682.0 | [13.0 | Bl | | | |
| 202817 Z DELPHINI— | | | | | | |
| | 4695.9 | 9.3 | Bi | 4712.7 | 9.7 | Pt |
| | 4702.7 | 9.6 | Pt | 4713.8 | 10.0 | Bi |
| | 4706.8 | 9.7 | Pw | 4726.7 | 10.2 | Pt |
| 202946 SZ CYGNI— | | | | | | |
| | 4686.7 | 9.5 | Pt | 4708.7 | 8.9 | Pt |
| | 4687.7 | 9.5 | Pt | 4710.7 | 9.0 | Pt |
| | 4688.6 | 9.4 | Pt | 4711.6 | 9.5 | Pt |
| | 4689.8 | 9.4 | Pt | 4712.6 | 9.6 | Pt |
| | 4694.8 | 8.8 | Pt | 4713.7 | 9.5 | Pt |
| | 4695.7 | 8.8 | Pt | 4717.6 | 9.7 | Pt |
| | 4696.7 | 9.0 | Pt | 4718.6 | 9.4 | Pt |
| | 4697.7 | 9.2 | Pt | 4720.6 | 8.8 | Pt |
| | 4702.7 | 9.5 | Pt | 4721.7 | 8.8 | Pt |
| | 4703.6 | 9.4 | Pt | 4722.7 | 9.0 | Pt |
| | 4704.6 | 9.6 | Pt | 4725.7 | 9.2 | Pt |
| | 4705.7 | 9.2 | Pt | 4726.6 | 9.5 | Pt |
| | 4706.6 | 9.0 | Pt | 4727.6 | 9.1 | Pt |
| | 4707.8 | 8.8 | Pt | | | |
| 202954 ST CYGNI— | | | | | | |
| | 4702.7 | 11.7 | Pt | 4713.6 | 12.3 | Ie |
| | 4707.8 | 11.6 | Bi | 4726.7 | 11.7 | Pt |
| | 4712.7 | 11.7 | Pt | | | |
| 203226 V VULPECULAE— | | | | | | |
| | 4702.7 | 8.6 | Pt | 4726.7 | 8.7 | Pt |
| | 4712.6 | 8.6 | Pt | | | |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| *203429* R MICROSCOPII— | | | | | | |
| | 4682.0 | [12.8 | Bl | | | |
| 203816 S DELPHINI— | | | | | | |
| | 4702.7 | 11.3 | Pt | 4726.7 | 10.2 | Pt |
| 203847 V CYGNI— | | | | | | |
| | 4670.2 | 9.5 | Ch | 4707.6 | 10.2 | Pc |
| | 4681.8 | 9.8 | Wf | 4707.8 | 9.0 | Bi |
| | 4694.9 | 9.7 | Wf | 4712.6 | 9.5 | Pt |
| | 4699.8 | 9.9 | Wf | 4717.2 | 10.2 | Ch |
| | 4702.7 | 8.8 | Pt | 4726.7 | 10.2 | Pc |
| | 4704.8 | 10.3 | Wf | 4726.7 | 9.7 | Pt |
| | 4707.1 | 10.5 | Ch | | | |
| *203905* Y AQUARII— | | | | | | |
| | 4673.3 | [10.8 | Ch | 4699.3 | [10.8 | Ch |
| 204016 T DELPHINI— | | | | | | |
| | 4673.2 | 9.9 | Ch | 4705.8 | 9.4 | Wf |
| | 4692.8 | 9.1 | Wf | 4709.6 | 9.1 | Cy |
| | 4699.2 | 9.5 | Ch | 4709 6 | 9.3 | Ie |
| | 4700.8 | 9.3 | Wf | 4712.6 | 9.4 | Pt |
| | 4702.7 | 8.9 | Pt | 4713.6 | 9.3 | Cl |
| | 4704.7 | 8.9 | Cy | 4726.7 | 9.5 | Pt |
| 204102 V AQUARII— | | | | | | |
| | 4704.6 | 8.1 | Pt | 4726.7 | 8.4 | Pt |
| | 4712.6 | 8.1 | Pt | | | |
| *204104* W AQUARII— | | | | | | |
| | 4678.6 | 9.8 | L | 4712.6 | 11.0 | L |
| | 4697.5 | 10.5 | L | | | |
| *204405* T AQUARII— | | | | | | |
| | 4699.3 | [11.0 | Ch | | | |
| 204846 RZ CYGNI— | | | | | | |
| | 4692.8 | 11.6 | Wf | 4707.8 | 11.2 | Bi |
| | 4700.8 | 11.7 | Wf | 4712.6 | 12.1 | Pt |
| | 4702.7 | 11.5 | Pt | 4713 6 | 12.3 | Cl |
| | 4705.8 | 11.8 | Wf | 4726.7 | 12.3 | Pt |
| 205017 X DELPHINI— | | | | | | |
| | 4695.9 | 10.0 | Bi | 4713.8 | 11.4 | Bi |
| | 4704.8 | 11.4 | Pt | 4726.7 | 12.4 | Pt |
| 205923 R VULPECULAE— | | | | | | |
| | 4671.3 | 9.2 | Ch | 4704.8 | 8.9 | Wf |
| | 4678.8 | 8 2 | Wf | 4704.8 | 8.7 | Pt |
| | 4681.8 | 8.1 | Wf | 4705.8 | 9.0 | Wf |
| | 4692.8 | 8.1 | Wf | 4706.8 | 9.0 | Wf |
| | 4694.8 | 8.1 | Wf | 4707.1 | 9.2 | Ch |
| | 4695.8 | 8.3 | Wf | 4707.8 | 9.0 | Wf |
| | 4699.8 | 8.6 | Wf | 4709 8 | 9.5 | Jo |
| | 4700.8 | 8.7 | Wf | 4713.8 | 9.4 | Bi |
| | 4702.8 | 8.7 | Wf | 4726.7 | 10.5 | Pt |
| *210504* RS AQUARII— | | | | | | |
| | 4697.5 | 13.6 | L | 4712.6 | 13.0 | L |
| *210516* Z CAPRICORNI— | | | | | | |
| | 4704.8 | 12.4 | Pt | | | |
| 210812 R EQUULEI— | | | | | | |
| | 4692.8 | 8.8 | Wf | 4705.8 | 8 9 | Wf |
| | 4700.8 | 8.9 | Wf | 4726.7 | 9.3 | Pt |
| | 4704.8 | 8.7 | Pt | | | |
| 210868 T CEPHEI— | | | | | | |
| | 4616.3 | 8.6 | Pg | 4694.4 | 6.5 | L |
| | 4655 ^ | 7.5 | Pg | 4695.8 | 7.0 | Wf |
| | 4670.2 | 7.4 | Ch | 4699.0 | 7.1 | Ik |
| | 4672.6 | 7.1 | L | 4700.7 | 7.2 | Cm |
| | 4673.0 | 8.1 | Ik | 4700.8 | 7.4 | Wf |
| 210868 T CEPHEI—Continued. | | | | | | |
| | 4675.0 | 8.0 | Ik | 4701.7 | 6.4 | Jo |
| | 4676.6 | 7.7 | Mm | 4702.4 | 6.6 | L |
| | 4677.0 | 8.0 | Ik | 4703.7 | 7.1 | Mm |
| | 4679.0 | 8.0 | Ik | 4704.8 | 7.1 | Wf |
| | 4681.8 | 7.7 | Wf | 4704.8 | 6.3 | Pt |
| | 4683.6 | 6.8 | L | 4707.1 | 6.4 | Ch |
| | 4684.0 | 7.8 | Ik | 4707.8 | 6.0 | Wb |
| | 4687.2 | 7.0 | Ch | 4716.5 | 6.3 | L |
| | 4688.7 | 6.5 | Jo | 4718.7 | 6.2 | Jo |
| | 4690.0 | 7.4 | Ik | 4726.7 | 6.3 | Pt |
| | 4692.0 | 7.3 | Ik | | | |
| 211614 X PEGASI— | | | | | | |
| | 4694.8 | 13.4 | Wf | 4704.8 | 12.9 | Wf |
| | 4699.8 | 13.0 | Wf | 4704.8 | 12.5 | Pt |
| *212814* Y CAPRICORNI— | | | | | | |
| | 4704.8 | 13.5 | Pt | | | |
| 213244 W CYGNI— | | | | | | |
| | 4676.4 | 6.5 | An | 4702.8 | 6.1 | Wf |
| | 4678.8 | 6.5 | Wf | 4704.8 | 6.2 | Wf |
| | 4681.8 | 6.4 | Wf | 4705.8 | 6.2 | Wf |
| | 4694.8 | 6.2 | Wf | 4706 8 | 6.3 | Wf |
| | 4695.8 | 6.2 | Wf | 4707.4 | 6.5 | An |
| | 4697.4 | 6.4 | An | 4707.8 | 6.2 | Wf |
| | 4699.8 | 6.2 | Wf | 4728.4 | 6.6 | An |
| | 4700.8 | 6.1 | Wf | | | |
| 213678 S CEPHEI— | | | | | | |
| | 4681.8 | 8.8 | Wf | 4704.8 | 9.0 | Wf |
| | 4695.8 | 8.6 | Wf | 4704.8 | 7.5 | Pt |
| | 4700.8 | 8.6 | Wf | 4712.3 | 8.3 | Ch |
| | 4702.6 | 8.9 | Lp | | | |
| 213753 RU CYGNI— | | | | | | |
| | 4671.3 | 8.2 | Ch | 4708.7 | 8.8 | Cy |
| | 4704.8 | 8.5 | Pt | | | |
| 213843 SS CYGNI— | | | | | | |
| | 4672.5 | 12.0 | L | 4708.2 | 9.5 | Ch |
| | 4673.5 | 11.7 | L | 4708.5 | 8.7 | Ro |
| | 4676.4 | 11.4 | L | 4708.6 | 8.9 | Pc |
| | 4678.8 | 11.8 | Wf | 4708.7 | 9.0 | Pt |
| | 4679.8 | 11.9 | Wf | 4708.7 | 8.8 | Cy |
| | 4681.7 | 11.8 | Wf | 4709.1 | 8 2 | Ch |
| | 4682.7 | 11.8 | Wf | 4709.5 | 8.5 | Kl |
| | 4683.6 | 11.3 | L | 4709.6 | 8.5 | Ie |
| | 4686.7 | 11.8 | Pt | 4709.6 | 8.5 | Jo |
| | 4687.7 | 11.7 | Pt | 4709.6 | 8.6 | Pc |
| | 4687.8 | 11.8 | Wf | 4709.6 | 8.2 | Cy |
| | 4688.6 | 11.7 | Ie | 4710.2 | 8.2 | Ch |
| | 4688.6 | 11.9 | Cl | 4710.6 | 8.9 | Pc |
| | 4688.6 | 11.7 | Pt | 4710.7 | 8.3 | Pt |
| | 4689.6 | 11.3 | L | 4711.2 | 8.3 | Ch |
| | 4689.8 | 11.7 | Pt | 4711.4 | 8 6 | Kl |
| | 4690.4 | 11.8 | L | 4711.5 | 8.7 | Ro |
| | 4692.6 | 11.9 | L | 4711.6 | 9.0 | Pc |
| | 4692.8 | 11.5 | Wf | 4711.6 | 8.5 | Pt |
| | 4694 4 | 11.6 | L | 4711.6 | 8.6 | Cl |
| | 4694.8 | 11.8 | Wf | 4711.8 | 8.7 | Sg |
| | 4694.8 | 11.7 | Pt | 4712.2 | 8.4 | Ch |
| | 4695.4 | 11.9 | L | 4712.6 | 8.8 | L |
| | 4695.6 | 11.9 | Ie | 4712.6 | 9.0 | Pt |
| | 4695.6 | 11.9 | Cu | 4712 7 | 9.4 | Sg |
| | 4695.7 | 11.8 | Pt | 4712.7 | 8.8 | Cy |

VARIABLE STAR OBSERVATIONS FOR THE MONTH ENDING JULY 31, 1926—Continued.

| Star | J.D. | Est. | Obs. | J.D. | Est. | Obs. |
|---|---|---|---|---|---|---|
| 213843 SS CYGNI—Continued. | | | | | | |
| | 4695.7 | 12.0 | Cy | 4713.4 | 8.9 | Kl |
| | 4695.8 | 11.8 | Wf | 4713.6 | 9.3 | Pc |
| | 4696.4 | 11.6 | L | 4713.6 | 9.2 | Cu |
| | 4696.6 | 11.8 | Cl | 4713.6 | 8.9 | L |
| | 4696.6 | 12.0 | Cu | 4713.6 | 9.1 | Cm |
| | 4696.7 | 11.8 | Pt | 4713.6 | 9.3 | Cl |
| | 4696.7 | 12.0 | Cy | 4713.6 | 9.0 | Jo |
| | 4697.5 | 11.6 | L | 4713.6 | 9.1 | Ie |
| | 4697.7 | 11.8 | Pt | 4713.7 | 9.5 | Pt |
| | 4697.7 | 11.9 | Cu | 4713.8 | 9.5 | Bi |
| | 4697.8 | 11.8 | Wf | 4714.4 | 9.5 | Kl |
| | 4699.2 | 11.9 | Ch | 4714.6 | 10.0 | Cl |
| | 4699.8 | 11.9 | Wf | 4714.6 | 9.8 | L |
| | 4700.4 | 11.3 | L | 4714.6 | 9.5 | Pc |
| | 4700.4 | 11.3 | An | 4715.5 | 10.1 | L |
| | 4700.7 | 11.7 | Jo | 4716.4 | 10.6 | Kl |
| | 4700.8 | 11.7 | Wf | 4716.6 | 9.7 | Jo |
| | 4701.6 | 11.7 | Ie | 4716.6 | 10.2 | Cu |
| | 4702.4 | 11.5 | L | 4716.6 | 10.1 | Cy |
| | 4702.4 | 11.6 | An | 4717.2 | 10.2 | Ch |
| | 4702.7 | 11.7 | Pt | 4717.6 | 10.7 | Pt |
| | 4702.8 | 11.6 | Wf | 4717.6 | 11.0 | L |
| | 4703.6 | 11.8 | Pt | 4718.6 | 11.5 | Pt |
| | 4703 7 | 12.0 | Mm | 4718.6 | 11.1 | Cy |
| | 4704.6 | 11.5 | Ie | 4718.6 | 11.1 | Ie |
| | 4704.6 | 11.8 | Pt | 4720.4 | 11.1 | L |
| | 4704.7 | 12.0 | Cy | 4720.6 | 11.8 | Pt |
| | 4704.8 | 11.8 | Wf | 4720.7 | 11.1 | Sg |
| | 4705.7 | 11.8 | Pt | 4721.6 | 11.5 | L |
| | 4705.8 | 11.8 | Wf | 4721.7 | 11.8 | Pt |
| | 4706.6 | 11.7 | Cy | 4723.7 | 11.5 | Sg |
| | 4706.6 | 11.8 | Pt | 4723.8 | 11.2 | Sg |
| | 4706.7 | 11.4 | Wf | 4724.6 | 11.6 | Ie |
| | 4706.8 | 11.4 | Pw | 4725.7 | 11.8 | Pt |
| | 4706.9 | 11.6 | Wf | 4725.8 | 11.5 | Sg |
| | 4707.1 | 11.7 | Ch | 4726.6 | 11.4 | Pc |
| | 4707.5 | 10.5 | L | 4726.6 | 11.7 | Pt |
| | 4707.6 | 11.2 | Pc | 4727.6 | 11.7 | Pt |
| | 4707.7 | 10 8 | Pt | 4728.4 | 11.1 | L |
| | 4707.8 | 10.9 | Bi | | | |
| 213937 RV CYGNI— | | | | | | |
| | 4697.7 | 8.0 | Cu | 4716.7 | 8.2 | Cu |
| | 4704.8 | 6.4 | Pt | 4720.6 | 7.9 | Cu |
| 214024 RR PEGASI— | | | | | | |
| | 4692.8 | 9.5 | Wf | 4704.8 | 9.2 | Pt |
| | 4700 8 | 9.2 | Wf | 4705.8 | 9.2 | Wf |
| *214217* R GRUIS— | | | | | | |
| | 4671.4 | 9.5 | Ht | 4685.4 | 8.3 | Ht |
| 215605 V PEGASI— | | | | | | |
| | 4713.8 | [13.2 | Bi | | | |
| *215717* U AQUARII— | | | | | | |
| | 4704.8 | 12.0 | Pt | | | |
| 215934 RT PEGASI— | | | | | | |
| | 4704.8 | 10.3 | Pt | 4713.8 | 11.3 | Bi |
| 220133 RZ PEGASI— | | | | | | |
| | 4704.8 | 9.0 | Pt | | | |
| 220412 T PEGASI— | | | | | | |
| | 4710.3 | [11.0 | Ch | | | |
| 220613 Y PEGASI— | | | | | | |
| | 4713.8 | [13.4 | Bi | | | |
| 220714 RS PEGASI— | | | | | | |
| | 4713.8 | [13.1 | Bi | | | |
| *221948* S GRUIS— | | | | | | |
| | 4671.4 | 12.5 | Ht | 4685.4 | 12.5 | Ht |
| 222439 S LACERTAE— | | | | | | |
| | 4704.8 | 11.7 | Pt | | | |
| *223462* T TUCANAE— | | | | | | |
| | 4648.5 | 7.8 | Ht | 4685.4 | 8.2 | Ht |
| | 4671.4 | 7.8 | Ht | | | |
| 223841 R LACERTAE— | | | | | | |
| | 4704.8 | 9.4 | Pt | | | |
| 225914 RW PEGASI— | | | | | | |
| | 4704.8 | 13.0 | Pt | | | |
| 230110 R PEGASI— | | | | | | |
| | 4694.8 | 9.0 | Wf | 4704.8 | 9.5 | Wf |
| | 4699.8 | 9.2 | Wf | 4704.8 | 9.3 | Pt |
| | 4701.8 | 9.8 | Gb | | | |
| 230759 V CASSIOPEIAE— | | | | | | |
| | 4701.7 | 8.3 | Cm | 4704.8 | 8.0 | Pt |
| | 4703.7 | 8.4 | Mm | 4708.7 | 8.3 | Cy |
| | 4704.7 | 8.2 | Cy | 4718.6 | 8.8 | Cy |
| 231508 S PEGASI— | | | | | | |
| | 4704.8 | 11.6 | Pt | | | |
| 232848 Z ANDROMEDAE— | | | | | | |
| | 4704.8 | 9.6 | Pt | | | |
| 233335 ST ANDROMEDAE— | | | | | | |
| | 4704.8 | 9.2 | Pt | 4710.3 | 9.3 | Ch |
| | 4707.7 | 10.0 | Gb | | | |
| *233815* R AQUARII— | | | | | | |
| | 4704.8 | 8.9 | Pt | 4710.3 | 9.2 | Ch |
| 233956 Z CASSIOPEIAE— | | | | | | |
| | 4695.7 | 14.6 | Wf | 4705.8 | 14.8 | Wf |
| | 4700.8 | 14.7 | Wf | 4726.8 | [13.1 | Cy |
| 235053 RR CASSIOPEIAE— | | | | | | |
| | 4522.4 | 11.6 | Bn | 4584.4 | 10.9 | Bn |
| | 4535.5 | 11.6 | Bn | 4621.5 | 10.4 | Bn |
| | 4562.4 | 11.0 | Bn | 4710.3 | [10.2 | Ch |
| *235209* V CETI— | | | | | | |
| | 4712.6 | 9.4 | L | | | |
| 235350 R CASSIOPEIAE— | | | | | | |
| | 4616.3 | 10.1 | Pg | 4697.8 | 6.3 | Io |
| | 4655.4 | 7.4 | Vv | 4700.8 | 6.5 | Wf |
| | 4658.4 | 6.9 | Vv | 4701.8 | 6.4 | Jo |
| | 4660.3 | 6.9 | Vv | 4703.7 | 6.5 | Mm |
| | 4670.4 | 6.5 | Cy | 4704.7 | 6.3 | Cy |
| | 4670.8 | 6.4 | Wf | 4716.7 | 7.0 | Io |
| | 4681.8 | 6.0 | Wf | 4718.7 | 7.3 | Io |
| | 4695.8 | 6.6 | Wf | | | |
| 235525 Z PEGASI— | | | | | | |
| | 4704.8 | 10.1 | Pt | | | |

Total observations, 2587; stars observed, 324; total observers, 36.

It is deeply regretted that Mr. W. F. H. Waterfield, due to the recent tragic death of Mrs. Waterfield, must relinquish, for the present at least, his hold on

variable star observing. His excellent contributions will be greatly missed from our reports. He has decided to make astronomy his profession rather than his hobby, and we wish him success therein.

The following observers have contributed to this report: Agapov, "Ag"; Ancarani, "An"; Baldwin, "Bl"; Benini, "Be"; Berman, "Bi"; A. N. Brown, "Bn"; Chandra, "Ch"; Chisolm, "Ch"; Cilley, "Cy"; Clement, "Cl"; Cunningham, "Cu"; Ensor, "En"; Gaebler, "Gb"; Glaze, "Gl"; Goodsell, "Gs"; Houghton, "Ht"; Iedema, "Ie"; Ikeda, "Ik"; Johnstone, "Jn"; Jones, "Jo"; Kukarkin, "Ku"; Lacchini, "L"; Leavenworth, "Lv"; Lepper, "Lp"; Millman, "Mm"; Parenago, "Pg"; Peltier, "Pt"; Proctor, "Pc"; Rhorer, "Ro"; Skaggs, "Sg"; Smith, "Sm"; Tchernov, "Tc"; Vorontsov-Velyaminov, "Vv"; Waterfield, "Wf"; Watson, "Pw", and Braid-White, "Wb".

LEON CAMPBELL, Recording Secretary.

September 7, 1926.

## COMET NOTES.

The comments given here relating to the comets now under observation have been contributed chiefly by Professor Van Biesbroeck of the Yerkes Observatory. Other data were collected from circulars from the *British Astronomical Association, Bureau Central Astronomique* (Copenhagen), and *Harvard College Observatory*.

**Comet 1925*b* (Reid).** — This object was last observed in January of this year. In computing its further course by means of Merfield's orbit I found that there was still a chance of picking it up this summer. On July 17 I found it almost exactly in the predicted position as a $15^M$ small nebulosity in Pisces. Since then I have followed it both visually and photographically. It is slowly decreasing in brightness and was of $16^M$ on September 10. The observed position was: July 17.36142 U. T., R. A. (1926.0) $1^h\,23^m\,18^s.29$, Dec. (1926.0) $+11°\,3'\,30''.5$.

**Periodic Comet 1926*c* (Kopff).** — This comet has been photographed here several times since it was picked up by M. Wolf, on July 13. It appears as a faint diffuse round nebulosity, some $40''$ in diameter, without appreciable condensation. The brightness has slowly increased from $17^M$ in July to $16^M$ in September, owing to the decreased distance from the earth. It is still very well situated for observation in the constellation of Pisces and it will probably be followed for some time.

**Periodic Comet 1926*d* (Finlay).** — This comet was rediscovered by Dr. Stobbe at Bergedorf on August 3, 1926. Its position at the time of the rediscovery, August $3^d\,0^h\,40^m.6$ U.T., was R. A. $4^h\,3^m\,48^s$, Dec. $+17°\,48'$, and its magnitude, 11.5. It passed perihelion four days later, August 7.6, according to a computation by Mr. Jens P. Möller. The comet is now becoming fainter but is coming into more favorable position for northern observers. An additional position of this comet has been deduced from a plate taken by Mr. F. J. Hargreaves, at Kingswood, Surrey, England. The exposure was made before the rediscovery by Stobbe, but the comet was not detected until afterwards. This position is: July $21^d\,1^h\,53^m.5$ U. T., R. A. (1926.0) $3^h\,2^m\,30^s.8$, Dec. (1926.0) $+13°\,19'\,36''$.

This is the brightest one of the three that are under observation now. On

September 10 I could see it in the morning sky with the 4-inch finder as a round diffuse nebulosity. In the 40-inch telescope the angular diameter was measured as 100″ and there was only a slight increase in brightness towards the center which made the object hard to set on. Yet its total brightness is about $11^{M}.5$. Its maximum brightness is already passed. It is moving slowly eastward through the constellation of Gemini.

**Wilk's Cometary Object.**—A cablegram from Professor E. Strömgren announced the discovery by Wilk, at Cracow, of a comet in the following position: September 1.9069 U. T., R. A. $15^{h}\,53^{m}\,12^{s}$, Dec. $+3°\,55'$. Magnitude 6. "Direct motion one degree in four minutes." A radiogram was received at Harvard College Observatory, direct from Cracow, confirming the announcement.

We had no success here in locating this unusual cometary object. The magnitude 6 given by the discoverer placed it at the limit of naked-eye visibility near ε Serpentis. But the unusual remark "direct hourly motion 15°" showed at once that this was a very uncommon appearance. In fact on receiving the message in the evening of September 2, I thought there was some erroneous interpretation and that 15° per day instead of per hour was already exceptional enough. Through haze and clouds I therefore exposed a pair of plates centered about 20° east of ε Serpentis with a wide-angle Ross lens. Only stars down to $8^{M}$ were recorded but no unexpected object was noticed. Cloudy weather interfered with further search the next few days but in the meantime the rapid angular motion was confirmed by a card from the Harvard College Observatory. I do not think there is any record of a celestial object, other than a meteor, showing such a rapid apparent motion across the sky. At that rate it was next to impossible to tell in what direction the object would have to be expected on the following days. If we consider it as a comet passing close to the earth its speed must have been about 42 km/sec. Taking into account the component of the earth's velocity I made a rough estimate showing that the object must have been at a distance from the earth less than twice the distance of the moon! I had supposed the object to move at right angles to the line of sight; otherwise the distance had to be still smaller. Under that assumption it was found that after an interval as short as twenty-four hours the object would have slowed down almost to a standstill somewhere in Aquila, but that at the same time it would have decreased in brightness by at least five magnitudes. On September 7 a plate was exposed for two hours by Messrs. Bobrovnikoff and Morgan on the region thus indicated but nothing suspicious was found.

Possibly more detailed information will enable computers to predict more closely where the object was to be expected; unless this can be done no further search of the plates can be attempted with any chance of success.

The object reminds us of the strange cometary appearance that was noticed May 4, 1916, at Cordoba by Perrine and Miss Glancy (*Pub. A. S. P.*, **28**, 176, 1916). Its displacement amounted to 10° per hour. The object might of course have been an unusual form of meteor; some of these have sometimes been followed for several hours. I cannot refrain from thinking also of a terrestrial source as a conceivable explanation. It is curious to note in this connection that from the time given for the observation the altitude of the object is found to have been only 4° above the horizon of Cracow, and that any stationary source of light (pilot light of a captive balloon, automobile headlight on a mountain, mirage of a terrestrial light, or what not) would have shown relatively to the stars an hourly motion of 15° in the direction indicated by the discoverer.

But it may be better not to anticipate anything about Wilk's unusual discov-

ery until further information about the circumstances of the observation are available. Such information is awaited with great interest.

September 15, 1926.

## COMMUNICATIONS.

**A Mist Rainbow.**—When walking along a railroad track near Old Forge, N. Y., in the early morning on August 9, I saw a very beautiful rainbow in the mist, which was not yet quite dispersed by the rising sun. I walked towards the west with the sun behind me, while the rainbow appeared in front of me. It was pale but well defined, as broad as the ordinary rainbow but otherwise more like a moon rainbow than a sun rainbow. This rainbow only lasted a minute or two and disappeared with the morning mist. Although the rays of the sun can as well be deflected in the dew drops of the morning mist as in ordinary raindrops, I think the phenomenon is rare.

P. M. Adler.

P. O. Box 394, Old Forge, N. Y.

**Illumination of Charts in Variable Star Observations.**—In connection with the communication from Mr. Bunch in the April number of Popular Astronomy (p. 278) I might remark that an arrangement which I have found very satisfactory and which is perhaps also one of the simplest for illuminating charts in Variable Star work is to place a hidden lamp in series with a hand lamp (handle, key-socket and shade) on a cord sufficiently long to reach across the dome. I am using at present a 30-watt bulb in the hand lamp and a 40-watt bulb hidden, but the intensity of the light may be varied by changing the bulbs, and may be reduced to an almost imperceptible glow by using a carbon filament bulb in the hand lamp and a small metallic filament bulb hidden. A single pole snap switch, mounted beside the plug to which the cord is attached and so connected as to short circuit the hidden lamp, allows one to have full light in the hand lamp when desired.

Bernhard H. Dawson.

Observatorio Astronómico, La Plata, May 10, 1926.

**Elliptical Lunar Halo in Manila, P. I.**—On July 23, 1926, at $9^h\,15^m$ P. M., Standard Time of the 120th meridian East of Greenwich, when the moon was about 50° above the horizon and close to the meridian of Manila, an elliptic halo was seen completely circumscribing the ordinary circular halo of 22°. The coloration at the upper and lower tangency was intense; red inside towards the center, and blue outside away from the moon. The separation between the horizontal vertices of the major axis and the corresponding extremes of the diameter was about one-fifth of the radius of the halo. Although looked for, no paraselenae were visible. The paraselenic circle was observed for more than fifteen minutes along an arc of over fifty degrees starting from the halo. The SE quadrant of the sky was covered with a thin cirrus veil with a milky aspect. I pay quite close attention to meteorological optical phenomena and although I have observed many solar and lunar halos and coronas, this is the first time in ten years that I have observed the elliptical lunar halo in Manila.

Miguel Selga.

Weather Bureau, Manila.

## GENERAL NOTES.

**Professor A. S. Eddington,** of Cambridge University, has been elected a member of the Athenaeum, for "distinguished eminence in science." (*Bulletin of the American Mathematical Society*, July-August, 1926.)

**Lewis A. Brigham,** Assistant Professor of Astronomy and Mathematics at Boston University, has been granted leave of absence for the years 1926-28, which will be spent in study at the Lick Observatory.

Mr. Claude W. Bruce, of the Harvard Astronomy Department, will give the work in general astronomy at Boston University next year.

**Miss Mary Proctor,** the well-known lecturer on astronomical subjects, is planning to be in the United States during the early months of 1927. Miss Proctor will arrange a party to view the total eclipse of the sun in June. Her party will probably select some station in Norway.

**Professor R. D. Bohannan,** who had just completed thirty-nine years as head of the department of mathematics at the Ohio State University, died suddenly June 20, 1926, at the age of seventy-one. His death was due to apoplexy. (*The American Mathematical Monthly*, June-July, 1926.)

**A New Variable Star in Ophiuchus.**—On a plate taken at the Radcliffe Observatory, Oxford, England, on July 16, 1926, Mr. H. G. S. Barrett found a star in R. A. $18^h\,32^m\,27^s$, Dec. $+7°\,37'.4$ (1926.0) of photographic magnitude 11.0. Plates taken of this field in July, 1911 and 1912, show nothing in this position as bright as of magnitude 15. An additional plate taken on July 30 shows no appreciable change in magnitude in the interval of 14 days. Visual observations made recently do not disclose any variation in brightness. (*A. N.*, No. 5459.)

**Two Stars Which Are Slightly Variable.**—In *Astronomische Nachrichten*, No. 5459, S. Blazko, of Moscow, calls attention to two stars which vary through a small range. The first, BD $+57°45$, is normally of magnitude 9.4 and diminishes about half a magnitude. The few determinations that have been made seem to indicate a period of approximately 15 days. The second, BD $+57°2824$, is normally also of magnitude 9.4 and diminishes three or four tenths of a magnitude. This star is photographically much fainter, and consequently is a yellow or red star.

**Bequest for an Astronomical Observatory Contested.**— The will of Mr. W. J. McDonald of Paris, Texas, leaving more than a million dollars for an Astronomical Observatory in connection with the University of Texas, is being contested by his relatives and the case was tried in the Lamar County, Texas, District Court from August 29 to September 11. It was alleged that Mr. McDonald was of unsound mind at the time of making the will, but the jury found him to be of sound mind and the bequest stands. There may be an appeal to the higher courts.

**A Table of Orbits of Visual Binary Stars.**—In the *Bulletin of the Astronomical Institutes of the Netherlands*, No. 101, is given a list of 117 visual binaries together with the elements of their respective orbits, collected from various sources. The one of longest period is the star designated Σ 1639, whose period is given as 690 years. The one of shortest period is δ Equulei, whose period is given as 5.70 years. The stars are all bright enough to be visible in telescopes of small aperture. This, therefore, would be an interesting working list for amateurs whose equipment contains a micrometer.

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**Changes Upon Mars.**—The effects of the transfer of the water from the southern to the northern polar regions have occurred much earlier in the planet's year this season than they did in 1924, and several most surprising markings have appeared, which we propose to illustrate later. It is to be hoped that those who have intended to photograph the planet's spectrum in order to determine the amount of water in its atmosphere have done so already, since the northern polar cap is already of very considerable size.

W. H. Pickering.

September 7, 1926.

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**Request for Double-Star Observations.** — Preparations of printer's copy for the extension to Burnham's General Catalogue of Double Stars is now in progress. I hope to be able to include in it all measures of double stars north of —30° declination which are made before 1927.0, whether or not they are in print by that time. To this end I respectfully request that double-star observers send me in manuscript form the results of measures which are not to be printed until a later date. Such measures should reach me not later than March 1, 1927.

I also request that copies be sent me of any short lists of measures which have been printed elsewhere than in the standard journals of astronomy.

Robert G. Aitken.

Lick Observatory, Mount Hamilton, California.
1926, June 22.

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**The Density of the Earth, and the Inferences to be Drawn From It,** by P. R. Heyl, Bureau of Standards.—The first recorded estimate of the earth's density was made by Newton who stated that its probable value was between five and six times that of water. Later investigators, especially Cavendish, Boys, and Braun, have confirmed this estimate of Newton's. The present accepted value, 5.52, is based upon the independent work of Boys and Braun thirty years ago. A redetermination of this constant is now in progress at the Bureau of Standards, using the Cavendish torsion balance in a vacuum, as used by Braun. An obvious consequence of this density of 5.52, as compared with the average density of the crustal rocks, something like 2.5, is that the interior of the earth must be composed of very heavy materials, possibly metallic iron. (*American Journal of Science*, September, 1926.)

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**Twenty-five Foot Telescope Proposed.**—In the August (1926) number of the *Publications of the Astronomical Society of the Pacific* is given an interesting discussion by Dr. F. G. Pease, on the possibility of the construction of telescopes considerably larger than any thus far constructed. To fix the ideas, Dr. Pease has described somewhat fully the circumstances attendant upon the construction of a telescope twenty-five feet in diameter. Dr. Pease does not

mean to imply, however, that this is necessarily the size of the largest telescope that could be constructed. He states that his reply to the question as to how large a telescope can be built today would be "that anything up to a hundred feet in aperture can be built provided one wants to pay for it." He estimates that the cost of a twenty-five foot instrument and a dome for it would range from twelve million to eighteen million dollars, depending chiefly upon the focal length. Accompanying the article is a drawing showing the relative size of the proposed telescope in comparison with the 100-inch on Mount Wilson. As might be imagined, the 100-inch telescope and dome seem diminutive in comparison. Such a telescope would open fields of astronomical investigation which can not now be touched.

This same question is discussed by Professor Henry Norris Russell in the September (1926) issue of the *Scientific American*. Both of these articles afford exceedingly interesting reading to anyone for whom astronomical study has an appeal.

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**A New Name for the Unit of Distance in Stellar Astronomy.**—In order to measure the distances of stars one ordinarily uses the *parsec*, that is to say, a distance corresponding to a parallax of 1″. But this unit is not sanctioned by all astronomers. They do not see why a unit of distance should be defined by an angle. Moreover, the parsec is not the same as the distance used for defining the absolute magnitude of stars.

M. Salet, in the *Bulletin de L'Observatoire De Lyon*, 1926, suggests a return to the unit employed formerly, the *siriometer*, which has the value of one million times the radius of the earth's orbit, that is to say, a million times the unit used in planetary astronomy.

But the siriometer has the disadvantage that its name suggests the idea of a measuring apparatus and, moreover, it is not by any means the distance to Sirius.

It is customary nowadays to give to units of measure the names of noted scientists. M. Salet proposes to give the name of Herschel to the new unit.

If one wishes to relate astronomical measures to the metric system, one might adopt a decimal power of a kilometer, for example, $10^{13}$. This unit would represent quite nearly a light year, and we know this latter unit, which strikes the imagination, will always be used in the teaching of astronomy.

Whatever solution may be adopted, M. Salet thinks that it should remove from astronomy the lack of consistency which results from employing the parsec as a unit of distance, and a unit ten times as large for defining absolute magnitude. (Translated from *L'Astronomie*, May, 1926.)

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**Brashear-McDowell Interests Sold.**—The present ownership of the Brashear and the McDowell interests has been preceded by a number of logical circumstances, which date back to the time when the late G. L. Fecker was with Fauth & Co., of Washington, D. C., where in 1894 he performed work of honorable mention as a designer and maker of optical instruments. The Fauth interests were later owned by Saegmiller.

When Mr. G. L. Fecker had been in Washington but four years, he made the acquaintance of Dr. John A. Brashear, who was instrumental in bringing him to Warner & Swasey, in Cleveland. The first piece of work assigned to him there was the completion of the Swasey Dividing Engine, which is now counted the most accurate. He remained with the company until 1915, when he received leave of absence on account of poor health, and was retired on full pay. During his years of active employment, he did much original scientific work, and co-

operated with Dr. Brashear in a good many of the optical instruments made by Warner & Swasey, the optical parts of which were made by Brashear.

During the years of his illness, he was succeeded in the work by his only son, J. W. Fecker. Shortly after the death of G. L. Fecker, in 1922, J. W. Fecker resigned his position with The Warner & Swasey Company to engage in the business of designing and constructing optical instruments in entirety, that is, both the mechanical and the optical parts, thereby opening wider opportunities for original work.

In November, 1923, a few weeks preceding Mr. McDowell's death, he visited the Fecker shop in Cleveland, and asked if he would not come down to Pittsburgh and combine the Fecker business with his, Mr. Fecker to take full active charge, thereby relieving Mr. McDowell of the numerous and difficult tasks. Before negotiations were completed, Mr. McDowell died suddenly. Mrs. McDowell continued the business successfully as long as her good health held out. Upon her death, the estate naturally sought relief from the situation in which it found itself, having to run a scientific business with no guiding head active in the office and shop. The first thought was to take up negotiations started by Mr. McDowell, and these were satisfactorily closed in May.

J. W. Fecker, son of G. L. Fecker and Emma B. Fecker, is descended from families whose chief work has been in optics, for optical manufactories established by his predecessors on both sides are still flourishing in Europe. Hence it was the end and aim of both parents to have their son establish himself in the work and to make scientific advancement, should it be given to him to do so. Accordingly, he received intensive theoretical and practical training under his late father, and other theoretical training as graduate of Case School of Applied Science, Cleveland.

The present organization has kept the old and experienced men, several of whom have been skilled by Dr. Brashear and Mr. McDowell; and, added to these, the men from the Fecker shop, some of whom were trained by G. L. Fecker.

The plan at present is to continue the optical work formerly done by Brashear and McDowell, and to make, besides, mechanical mountings for any instruments required; also to make optical instruments not heretofore undertaken by either of the two concerns, nor by the Cleveland concern with whom they coöperated.

1954 Perrysville Avenue, Observatory Station, Pittsburgh, Pa., U. S. A.

## BOOK REVIEWS.

**The Barton Constellation Charts** (S. G. Barton, 26 N. Millick St., Philadelphia, Pa., $1.00 per set postpaid in the United States).

Three detail charts A, B, and C, with four pages of description and explanation have just been issued. They supplement Charts 1 to 12. Charts A, B, and C are made on the same general plan but show the Greek letters applying to the stars and circles from which the positions of the stars (right ascension and declination) may be read. They are reliable and very convenient for those who desire these details.

**The Naval Observatory and the Bureau of Standards** (The Johns Hopkins Press, Baltimore, Md., $1.00 and $2.00 respectively).

There have just been issued two valuable monographs on these institutions by the Johns Hopkins Press for the Institute for Government Research. This institute "is an association of citizens for co-operating with public officials in the scientific study of government with a view to promoting efficiency and economy in its operations and advancing the science of administration." The monographs are prepared according to a uniform plan. They give: 1. The history of the establishment and development of the service; 2. Its functions, stating these specifically; 3. Its organization; 4. The character of its plant; 5. A compilation of, or reference to, the laws and regulations governing its operations; 6. Financial statements of appropriations and expenditures for a series of years; 7. A bibliography of sources of information.

The two monographs under consideration carry out the above outline in a most admirable manner in that they furnish a list of facts necessary for a clear understanding of what the Naval Observatory and Bureau of Standards are and what they accomplish. Every reasonable effort seems to have been made to ascertain facts. No suggestions are afforded for improvement nor are criticisms of any kind made. Those interested in such matters are free to draw their own conclusions from the material presented. From the historical standpoint some might wish that an effort had been made to evaluate the services of the leaders such as Newcomb and Stratton, but this would have led, at least in part, into controversial ground and possibly would have defeated the very purpose of the monographs.

From personal knowledge the reviewer cannot point out any errors in the monograph on the Bureau of Standards but feels he should call attention to three such in the monograph on the Naval Observatory, since accuracy is of the greatest importance in a paper of this character. On page 1 it is stated that accurate time *cannot* be obtained from any other source in the country whereas there are a number of observatories which could furnish it if there were any need of their doing so. On page 50 it is stated that "throughout the country the clocks of railroad and navigation companies . . . . and indirectly, all the clocks in private use, are regulated by the Naval Observatory signals," whereas a number of the important transcontinental railways passing through Minneapolis and St. Paul have used for many years and are still using Goodsell Observatory time. On page 52 it is stated that since January 1, 1913, the *American Ephemeris and Nautical Almanac* gives positions of the sun at two-hour intervals instead of 24-hour intervals as formerly, whereas no change was made. Aside from these minor errors the monograph on the Naval Observatory appears to be correct in its statement of fact.

Both monographs represent much careful work and should be read by all who desire authoritative information on these two branches of government service.

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**Next Issue.**—The report of the Nantucket meeting of the American Astronomical Society reached us as the last forms of this issue were being put on the press. This report, with the abstracts of some of the papers read at the meeting, will constitute one of the principal features of the November issue. Besides this the November issue will contain a paper by Professor F. Schlesinger, giving an account of the establishing of the Yale Observatory in Johannesburg, South Africa. It will also contain a paper by Professor William H. Pickering outlining his experience in beginning to use a small reflector.

The November issue will be mailed November 1.

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